PATENT ABSTRACTS OF JAPAN

(11)Publication number:

2003-261770

(43) Date of publication of application: 19.09.2003

(51)Int.Cl.

CO8L 83/05 CO8K 3/36 H01L 21/56 H01L 23/29 H01L 23/31

(21)Application number: 2002-063122

(71)Applicant: KANEGAFUCHI CHEM IND CO LTD

(22)Date of filing:

08.03.2002 -

(72)Inventor: OUCHI KATSUYA

(54) SEALANT, METHOD OF SEALING FOR SEMICONDUCTOR DEVICE OR THE LIKE, METHOD OF PRODUCTION FOR SEMICONDUCTOR DEVICE, AND SEMICONDUCTOR DEVICE

(57) Abstract:

PROBLEM TO BE SOLVED: To provide a sealant having high practicality with low viscosity, rapid curing at low temperature, and to provide a method of sealing for electronic parts, electric circuits, electric contacts or semiconductors, or a method of production for semiconductor device and to provide a semiconductor device comprising semiconductors sealed by the same.

SOLUTION: The sealant contains (A) an organic compound which has at least two carbon-carbon double bonds reactive with SiH groups in the molecule, (B) a compound having at least two SiH groups in the molecule. (C) a catalyst for hydrosilylation, and (D) a filler, as essential components.

damages caused by the use of this translation. JPO and INPIT are not responsible for any

.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

which has a SiH group and reactivity in [at least two] one molecule, a compound which contains at least Claim 1](A) Encapsulant containing an organic compound which contains a carbon-carbon double bond two SiH groups in one molecule (B), the (C) hydrosilylation catalyst, and the (D) filler as an essential ingredient

(Claim 2](A) The encapsulant according to claim 1 being that in which an ingredient contains 0.001 mol or more perg of (A) ingredient of carbon-carbon double bonds which have a SiH group and reactivity.

Claim 3](A) Claim 1, wherein ingredients are C, H, N, O, S, and a thing that consists only of halogen as a

composing element, or encapsulant given in 2.

[Claim 4](Å) The encapsulant according to any one of claims 1 to 3 making that an ingredient contains 1−6 vinyl groups in one molecule of ⟨b⟩s, that a (⁴*) molecular weight is less than 900, and for viscosity in (⁴*) 23 ** to be less than 1000 poise into an indispensable condition.

Claim 5](A) An ingredient is following general formula (I).

differ or those of \mathbb{R}^1 in a formula may be the same.) — the encapsulant according to any one of claims 1 to (the organic group of the monovalence of the carbon numbers 1–50 may be expressed, and each R^1 may 4 being an organic compound expressed.

Claim 6](B) Encapsulant given in any 1 paragraph of claims 1 thru/or 5, wherein molecular weights of an ingredient are 50-700.

Claim 7]The encapsulant according to any one of claims 1 to 6 being a compound characterized by

comprising the following which can obtain a chain and/or annular polyorganosiloxane (beta) by the ability to carry out a hydrosilylation reaction.

B) An organic compound in which an ingredient contains a carbon-carbon double bond which has a SiH

group and reactivity in [one or more] one molecule (alpha).

hey are at least two SiH groups in one molecule.

Claim 8](beta) An ingredient is following general formula (II).

Formula 2]

,among a formula, R^2 expresses the organic group of the carbon numbers 1–6, and n expresses the number, of 3–10.) — the encapsulant according to claim 7 being the annular polyorganosiloxane which is expressed. and which has at least three SiH groups in one molecule.

Claim 9](D) The encapsulant according to any one of claims 1 to 8, wherein an ingredient is a silica system

Claim 10](D) The encapsulant according to any one of claims 1 to 9, wherein an ingredient is a filler with a mean particle diameter of 10 micrometers or less.

characterized by content of a particle with a particle diameter of not less than 50 micrometers being 1 or Claim 11](D) The encapsulant according to any one of claims 1 to 10 in which an ingredient is less % of the weight of a filler.

Claim 12](D) The encapsulant according to any one of claims 1 to 11 being a filler with a spherical ngredient

Claim 13]The encapsulant according to any one of claims 1 to 12, wherein viscosity at 23 ** is 1000 or ess Pa-s [Claim 14]The encapsulant according to any one of claims 1 to 13, wherein penetration time to the 50~ micrometer crevice at 60 ** is 120 or less seconds/cm.

Claim 15]The encapsulant according to any one of claims 1 to 14, wherein weight loss under hardening is 5 or less % of the weight

Claim 16]The encapsulant according to any one of claims 1 to 15, wherein gel time at 120 ** of a

Claim 17]The encapsulant according to any one of claims 1 to 16, wherein Tg of a hardened material is not hardened material is less than 120 seconds.

less than 100 **.

Claim 18] The encapsulant according to any one of claims 1 to 17 whose extraction ion content from a nardened material is less than 10 ppm.

Claim 19]The encapsulant according to any one of claims 1 to 18 used in order to close a semiconductor. Claim 20]Under-filling which consists of the encapsulant according to claim 19.

Claim 21] Electronic parts closing electronic parts, an electric circuit, or electric contact with encapsulant of a statement in any 1 paragraph of claims 1 thru/or 18, an electric circuit, a sealing method of electric

Claim 22]A sealing method of a semiconductor closing a semiconductor by encapsulant according to claim 19 or the under-filling according to claim 20.

Claim 23]A manufacturing method of a semiconductor device closing a semiconductor by encapsulant according to claim 19 or the under-filling according to claim 20.

[Claim 24] A semiconductor device with which encapsulant according to claim 19 or the under-filling according to claim 20 comes to close a semiconductor.

* NOTICES *

damages caused by the use of this translation. JPO and INPIT are not responsible for any

. This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

hypoviscosity and low-temperature fast curability in more detail, and is high, It is related with the sealing nethod of the electronic parts which close electronic parts, an electric circuit, electric contact, or a semiconductor device, and the semiconductor device with which it comes to close a semiconductor. Field of the Invention] The encapsulant whose practicality this invention relates to encapsulant, are semiconductor by it, an electric circuit, or a semiconductor or the manufacturing method of a

semiconductor package, etc. in recent years TAB closure, Liquefied encapsulants including the under-filling widely used for these liquefied encapsulants. The fundamental characteristic required of such encapsulants is heat resistance, an adhesive property, etc. which do not make parts produce fault also by heat histories, closure for flip chip bonding, etc. are used, and the epoxy resin composition which mainly used the epoxy Description of the Prior Art]As encapsulant, especially encapsulant for semiconductors, the epoxy resin composition which used the polyfunctional epoxy compound, the phenol novolac system hardening agent, compound, the acid anhydride system hardening agent, and the inorganic filler as the main ingredients is and the inorganic filler as the main ingredients is used widely. With the miniaturization demand of a such as a solder reflow.

slit by the further fluid improvement by enlargement of a semiconductor and densification, etc. is called for ow-temperature fast curability is demanded. In liquefied encapsulant, the high-speed perviousness to the (0003]Generally, hardening takes an elevated temperature and a long time to an epoxy resin composition, become long, in order to manufacture easily, to make a cycle quick and to reduce a manufacturing cost, nanufacture of a semiconductor package etc. is difficult for it, and although a manufacturing cycle may

described above, various improvement is proposed in the epoxy resin (JP,5-222270,A.) JP,6-5743,A, JP,6-206982,A, JP,7-165876,A, JP,9-31161,A, JP,9-246435,A, JP,10-101906,A, JP,11-21421,A, JP,11-92549,A, JP,11-140069,A, JP,11-255864,A, JP,11-256012,A, JP,11-269250,A, JP,2000-3982,A, JP,2000-7891,A, 0004]in order to improve low-temperature fast curability and high-speed perviousness which were JP,2000-53844,A, JP,2000-63630,A.

[0005]On the other hand, the hardenability constituent in which hardening generally used the quick hydrosilylation reaction for the hardening reaction is also proposed (JP,50–100,A, JP,9–291214,A, JP,1– 26336, A, JP,5-295270, A).

this invention are hypoviscosity and low-temperature fast curability, and is high, it is providing the sealing Problem(s) to be Solved by the Invention] Therefore, the encapsulant whose practicality the purposes of method of the electronic parts which close electronic parts, an electric circuit, electric contact, or a semiconductor device, and the semiconductor device with which it comes to close a semiconductor. semiconductor by it, an electric circuit, or a semiconductor or the manufacturing method of a

wholeheartedly a carbon-carbon double bond which has the (A) SIH group and reactivity in [at least two] one molecule as a result of research in order to solve this technical problem, (B) By considering it as Means for Solving the Problem]An organic compound in which this invention persons contain

hydrosilylation catalyst, and (D) silica system bulking agent as an essential ingredient, it found out that anencapsulant containing a compound which contains at least two SiH groups in one molecule, the (C) aforementioned problem was solvable and resulted in this invention.

ingredient contains 0.001 mol or more perg of (A) ingredient of carbon-carbon double bonds which have a [0008]Namely, an organic compound in which this invention contains a carbon-carbon double bond which encapsulant (claim 3) given in 2, and the (A) ingredient contains 1-6 vinyl groups in one molecule of (b)s, SiH group and reactivity. Are the encapsulant (claim 2) according to claim 1, and the (A) ingredient as a (**) that a molecular weight is less than 900 and (**) — it is the encapsulant (claim 4) according to any hydrosilylation catalyst which contain at least two SiH groups in one molecule, (D) It is the encapsulant (claim 1) containing a filler as an essential ingredient, (A). It is characterized by being that in which an one of claims 1 to 3 making for viscosity at 23 ** to be less than 1000 poise into an indispensable composing element C, It is claim 1 being H, N, O, S, and a thing that consists only of halogen, or has the (A) SiH group and reactivity in [at least two] one molecule, (B) A compound, the (C) condition — the (A) ingredient — following general formula (I)

Formula 3

ingredient are 50–700, (B) The organic compound (alpha) in which an ingredient contains the carbon-carbon annular polyorganosiloxane (beta) which has at least two SiH groups in one molecule, it is the encapsulant encapsulant (claim 6) given in any 1 paragraph of claims 1 thru/or 5, wherein the molecular weights of an (claim 7) according to any one of claims 1 to 6 being a compound which can be obtained by the ability to (the organic group of the monovalence of the carbon numbers 1–50 may be expressed, and each R^1 may differ or that of R¹ in a formula may be the same.) — it being the encapsulant (claim 5) according to any one of claims 1 to 3 by which it is characterized, and that it is an organic compound expressed, (B) It is double bond which has a SiH group and reactivity in [one or more] one molecule, The chain and/or carry out a hydrosilylation reaction, and an ingredient (beta) is following general formula (II).



micrometers is 1 or less % of the weight of a filler, (D) It is the encapsulant (claim 12) according to any one $(\mathtt{R}^2$ expresses the organic group of the carbon numbers 1–6 among a formula, and n expresses the number polyorganosiloxane which has at least three SiH groups in one molecule, (D) It is the encapsulant (claim 9) of claims 1 to 11 being a filler with a spherical ingredient, It is the encapsulant (claim 13) according to any one of claims 1 to 12, wherein the viscosity at 23 ** is 1000 or less Pa-s, It is the encapsulant (claim 14) according to any one of claims 1 to 13, wherein the penetration time to the 50-micrometer crevice at 60 encapsulant (claim 10) according to any one of claims 1 to 9, wherein an ingredient is a filler with a mean particle diameter of 10 micrometers or less, (D) An ingredient is the encapsulant (claim 11) according to any one of claims 1 to 10, wherein the content of a particle with a particle diameter of not less than 50 ** is 120 or less seconds/cm, It is the encapsulant (claim 15) according to any one of claims 1 to 14, wherein the weight loss under hardening is 5 or less % of the weight, It is the encapsulant (claim 16) of 3-10.) -- it is expressed. It is the encapsulant (claim 8) according to claim 7 being the annular according to any one of claims 1 to 8, wherein an ingredient is a silica system filler, (D) It is the

ancapsulant (claim 19) according to any one of claims 1 to 18 used in order to close a semiconductor, it is electronic parts closing electric contact, It is a sealing method (claim 21) of an electric circuit and electric according to claim 19 or the under-filling according to claim 20, It is a manufacturing method (claim 23) of contact, and is a sealing method (claim 22) of the semiconductor closing a semiconductor by encapsulant according to any one of claims 1 to 15, wherein the gel time at 120 ** of a hardened material is less than illing according to claim 20, It is a semiconductor device (claim 24) with which encapsulant according to the semiconductor device closing a semiconductor by encapsulant according to claim 19 or the underunder-filling (claim 20) which consists of the encapsulant according to claim 19, In any 1 paragraph of nardened material is not less than 100 **. The extraction ion content from a hardened material is the 120 seconds, it is the encapsulant (claim 17) according to any one of claims 1 to 16, wherein Tg of a claims 1 thru/or 18, with the encapsulant of a statement Electronic parts, An electric circuit or the encapsulant (claim 18) according to any one of claims 1 to 17 which is less than 10 ppm, It is the claim 19 or the under-filling according to claim 20 comes to close a semiconductor.

Embodiment of the Invention]Hereafter, this invention is explained in detail

(A) ingredient) The (A) ingredient in this invention is explained first.

(0012)(A) Especially if an ingredient is an organic compound which contains the carbon-carbon double bond which has a SiH group and reactivity in [at least two] one molecule, it will not be limited. It is preferred that it is what does not include siloxane units (Si-O-Si) like polysiloxane organicity block copolymer or a nalogen as a composing element. In the case of a thing including siloxane units, there is a problem of gas polysiloxane organicity graft copolymer as an organic compound, and contains only C, H, N, O, S, and permeation nature or crawling.

(0013)The connecting position in particular of the carbon-carbon double bond which has a SiH group and eactivity is not limited, but may exist anywhere in intramolecular.

(0014](A) The organic compound of an ingredient can be classified into the compound and organic

nonomer system compound of an organic polymer system.

0015]As an organic polymer system compound, for example, a polyether system, a polyester system, The ınsaturation hydrocarbon system, a polyacrylic ester system, a polyamide system, a phenolformaldehyde compound of a polyarylate system, a polycarbonate system, a saturated hydrocarbon system, an

nydrocarbon system:heterocyclic system, such as aromatic hydrocarbon system:straight chain systems, such as a phenol system, a bisphenol system, benzene, and naphthalene, and an alicycle system, are 0016]As an organic monomer system compound, compounds, these mixtures, etc. of an aliphatic system (phenol resin system), and a polyimide system can be used. mentioned

0017](A) Although not limited especially as a carbon-carbon double bond which has a SiH group of an ngredient, and reactivity, it is following general formula (III) 9018

Formula 5]

 $^{
m R}{}^3$ in a formula expresses a hydrogen atom or a methyl group.) — the basis shown is preferred from a reactant point. From the ease of acquisition of a raw material, [0019]

[Formula 6]

Especially *** shown is preferred.

(0020](A) As a carbon-carbon double bond which has a SiH group of an ingredient, and reactivity, it is ollowing general formula (IV).

Formula 7]

httn://www.d ind innit on in/coi-hin/tran wah coi alia?atw 11=httn#3.4%9F%9FWww.d indl innit on 90A8/03/A6

 $(\mathsf{R}^4$ in a formula expresses a hydrogen atom or a methyl group.) — the alicyclic basis shown is preferred from the point that the heat resistance of a hardened material is high. From the ease of acquisition of a raw material, [0022]

Formula 8]

Especially the alicyclic basis shown is preferred.

the skeletal part of the (A) ingredient, and the covalent bond may be carried out via the substituent more [0023]The carbon–carbon double bond which has a SiH group and reactivity may be coupled directly with divalent, it will not be limited, but C, H, N, O, S, and the thing containing only halogen are preferred as a than divalent. Especially if it is a substituent of the carbon numbers 0-10 as a substituent more than composing element. As the example of these substituents, [0024]

[Formula 9]

(nは1~10の数を表す。)

(nは0~4の数を設す。)

Formula 10]

(nは0~4の数を表す。)

*****************. Two or more of the substituents more than divalent [these] are connected by a covalent bond, and they may constitute the substituent more than divalent [one].

[0026]As an example of the basis which carries out a covalent bond to the above skeletal parts, A vinyl group, an allyl group, a metallyl group, an acrylic group, an methacrylic group, a 2-hydroxy-3-(allyloxy) propyl group, 2-allyl phenyl group, 3-allyl phenyl group, 4-allyl phenyl group, A 2-(allyloxy) phenyl group, 3-(allyloxy) phenyl group, 2-(allyloxy) phenyl group, 2-(allyloxy) phenyl group, 2-(allyloxy) ethyl group, 2, and 2-bis(aryloxymethyl)butyl group, the 3-allyloxy 2, a 2-bis(aryloxymethyl)propyl group, [0027]

-(cr-cs,-c)-cs,-cs-cs,

(nは5≧n≧2を満足する数を表す。),

から選ばれる2価の基を表す。)

5 5

(nは0~4の数を表す。)

[0028]As a concrete example of an ingredient, (A) Diallyl phthalate, triallyl trimellitate, Diethylene-glycol bisallyl carbonate, trimethylolpropane diaryl ether, Pentaerythritol triaryl ether, 1,1,2,2, – tetra allyloxy ethane, Diallylideneidenepenta Elislit, triaryl cyanurate, triallyl isocyanurate, 1,2,4–TORIBI nil cyclohexane and divinylbenzenes (the thing of 50 to 100% of purity.) Preferably The thing of 80 to 100% of purity, divinylbiphenyl, 1, 3-diisopropenylbenzene, 1,4-diisopropenylbenzene and those oligomer, 1,2-polybutadiene (1, the thing of 10 to 100% of two ratios, preferably thing of 50 to 100% of 1 and 2 ratio), allyl ether of novolac phenol, arylation polyphenylene oxide, [0029]

$$\binom{\mathsf{R}_3}{\mathsf{R}(\mathsf{L}^{--}\mathsf{O}^{--}, -\mathsf{C}\mathsf{M}_2^{--}, -\mathsf{C}\mathsf{M}_2^{--}, -\mathsf{C}^{--} -\mathsf{C}^{--} -\mathsf{C}^{--} -\mathsf{C}^{--}$$
 $\mathsf{C}\mathsf{M}_3$, $\mathsf{C}\mathsf{F}_3$, O

[0030] [Formula 13]

What transposed a part or all of the glycidyl group of the conventionally publicly known epoxy resin besides to the allyl group is mentioned.

double bond as mentioned above, and is hard to express as an ingredient can also be used. As an example 0031](A) The low molecular weight compound which is divided into a skeletal part and a carbon-carbon of these low molecular weight compounds, butadiene, isoprene, Aliphatic series chain polyene compound compound systems, such as aliphatic series cyclic polyene compound systems, such as cyclohexadiene, cyclo-octadiene, a dicyclopentadiene, tricyclo pentadiene, and norbornadiene, vinylcyclopentene, and a systems, such as octadien and decadiene, a cyclopentadiene, Substitution aliphatic series cyclic olefin vinylcyclohexene, etc. are mentioned.

reactivity is preferred, what is contained 0.005 mol or more per g is more preferred, and what is contained (0032](A) As an ingredient, heat resistance from a viewpoint that it may improve more. A thing containing 0.001 mol or more perg of (A) ingredient of carbon-carbon double bonds which have a SiH group and 3.008 mol or more is still more preferred.

good to exceed 2 to improve dynamics intensity more, and it is more preferred that they are three or more ,0033](A) As for a SiH group of an ingredient, and the number of carbon-carbon double bonds which have pieces. (A) When a SiH group of an ingredient and the number of carbon-carbon double bonds which have reactivity, even if small [per molecule] on the average, it is preferred [with two pieces], although it is eactivity are one or less per 1 intramolecular, even if it reacts to the (B) ingredient, it does not become he structure of cross linkage only by becoming graft structure.

.0034](A) It is preferred that reactivity contains one or more vinyl groups in one molecule from a viewpoint. there is little cobwebbing nature of raw material liquid, and a moldability and handling nature are good, less stability becomes good easily, and it is more preferred to contain four or less vinyl groups in one molecule. than 900 thing has a preferred molecular weight, less than 700 thing is more preferred, and less than 500 molecule. It is preferred to contain six or less vinyl groups in one molecule from a viewpoint that storage .0035](A) As an ingredient, from a viewpoint that dynamic heat resistance is high, and a viewpoint that of being good, as an ingredient, and it is more preferred to contain two or more vinyl groups in one

or a phenolic hydroxyl group from a viewpoint of coloring, especially control of yellowing as an ingredient is a phenolic hydroxyl group is preferred. With a phenolic hydroxyl group in this invention, the benzene ring, a as viscosity, a thing below 1000 poise is preferred in 23 **, a thing below 300 poise is more preferred, and preferred, What does not contain a compound which has a derivative of a phenolic hydroxyl group and/, or .0036](A) As an ingredient, in order to acquire uniform mixing with other ingredients, and good workability, .0037](A) What has few content of a compound which has a derivative of a phenolic hydroxyl group and/ such as alkyl groups, such as a methyl group and an ethyl group, a vinyl group, and an allyl group, and an nydrogen atom of an above-mentioned phenolic hydroxyl group by acyl groups, such as alkenyl groups, a thing below 30 poise is still more preferred. Viscosity can be measured with E type viscosity meter. naphthalene ring, A hydroxyl group coupled directly with an aromatic hydrocarbon core illustrated by anthracene ring etc. is shown, A derivative of a phenolic hydroxyl group shows a basis replaced in a acetoxy group, etc.

ingredient of an aromatic ring is 50 or less % of the weight is preferred, 40 or less % of the weight of a thing is more preferred, and 30 or less % of the weight of a thing is still more preferred. Most desirable one does .0038]While an optical property is good like a photoelastic coefficient with a low double refraction factor being low, weatherability from a viewpoint of being good. That whose component weight ratio in the (A) not include aromatic hydrocarbon rings.

0039] From a viewpoint that there is little coloring of a hardened material obtained, optical transparency is preferred and triallyl isocyanurate, diaryl ether of 2,2-bis(4-hydroxycyclohexyl)propane, and especially iigh, and lightfastness is high. As an ingredient, (A) A vinylcyclohexene, a dicyclopentadiene, Triallyl isocyanurate, diaryl ether of 2,2-bis(4-hydroxycyclohexyl)propane, 1,2,4-TORIBI nil cyclohexane is 1,2,4-TORIBI nil cyclohexane are preferred.

nardened material obtained by the adhesive property of a hardenability constituent obtained becoming high group, an amino group, a radical polymerization nature unsaturation group, a carboxyl group, an isocyanate group, hydroxyl, alkoxy silyl groups, etc. are mentioned. When it has these functional groups, intensity of a 0040](A) As an ingredient, it may have other reactant groups. As a reactant group in this case, an epoxy easily becomes high easily. From a point that an adhesive property can become higher, an epoxy group is obtained becomes high easily, it is preferred to average a reactant group and to have in [one or more] preferred among these functional groups. In a point that the heat resistance of a hardened material

[0041](A) Independent, two or more sorts of things are mixed, and an ingredient can be used. (General formula (I))

(A) Following general formula (I) from a viewpoint that heat resistance and transparency are high as an ngredient

Formula 14]

 $\widehat{\Box}$

(the organic group of the monovalence of the carbon numbers 1-50 may be expressed, and each R¹ may differ or that of ${
m R}^1$ in a formula may be the same.) — the compound expressed is preferred.

monovalence of the carbon numbers 1-4. As an example of these desirable R¹, they are a methyl group, an (0043) From a viewpoint that the heat resistance of the hardened material obtained can become higher as sthyl group, a propyl group, a butyl group, a phenyl group, benzyl, a phenethyl group, a vinyl group, an allyl monovalence of the carbon numbers 1-10, and it is still more preferred that it is an organic group of the monovalence of the carbon numbers 1–20, it is more preferred that it is an organic group of the R¹ of the above-mentioned general formula (I). It is preferred that it is an organic group of the

group, and a glycidyl group, [0044] [Formula 15]

——(Ch2)¦cH3 (式中nは4~19の数)

- (ch₂)公=ch₂ (式中nは2~18の数)

-c-{-cn};cn=cn; (式中nは0~170数)

** is mentioned.

(0045)It is preferred that it is an organic group of the monovalence of the carbon numbers 1-50 in which at east one of three R¹ contains one or more epoxy groups from a viewpoint that an adhesive property with the various materials of the hardened material obtained can become good as R¹ of the above-mentioned general formula (1), [0046]

Formula 16]

come out and contain one or more epoxy groups expressed. As an example of these desirable R¹, it is a It is more preferred that it is an organic group of the monovalence of the carbon numbers 1-50 which

glycidyl group, [0047] Formula 17 —(ch.) が一ch, (式中nは2~18の数)

* is mentioned.

the carbon numbers 1~50. As an example of these desirable R¹, they are a methyl group, an ethyl group, a monovalence of the carbon numbers 1-50 which contain two or less oxygen atoms, and contain only C, H, and O as a composing element, and it is more preferred that it is a hydrocarbon group of monovalence of propyl group, a butyl group, a phenyl group, benzyl, a phenethyl group, a vinyl group, an allyl group, and a 0048] From a viewpoint that the chemical thermal stability of a hardened material obtained can become good as R¹ of the above-mentioned general formula (I). It is preferred that it is an organic group of glycidyl group, [0049] Formula 18]

—(CH2)CH3 (共中nは4~49の数)

—{chr}ch=chr (式中nは2~48の数)

** is mentioned.

[0050]As R¹ of the above-mentioned general formula (I), it is at least one of three R¹ from a viewpoint that reactivity becomes good. [0051]

[Formula 19]

It is preferred that it is an organic group of the monovalence of the carbon numbers 1–50 which come out and contain one or more bases expressed, and it is following general formula (III)

Formula 20] [0052]

ن. الراج

(R³ in a formula expresses a hydrogen atom or a methyl group.) — it is more preferred that it is an organic group of the monovalence of the carbon numbers 1-50 containing one or more bases expressed — the inside of three \mathbb{R}^1 — at least two — following general formula (V)

[0053]

Formula 21]

__CE__CE__CE__

 \Re^5 in a formula an organic group of bivalence of direct coupling or the carbon numbers 1-48) [express and] R^6 expresses a hydrogen atom or a methyl group. It is still more preferred that it is an organic compound (two or more $m R^5$ and $m R^6$ may differ from each other, respectively, or may be the same.)

obtained can become higher. It is preferred that it is an organic group of bivalence of direct coupling or the carbon numbers 1-20, it is more preferred that it is an organic group of bivalence of direct coupling or the (0054]Although R⁵ of the above-mentioned general formula (V) is an organic group of bivalence of direct coupling or the carbon numbers 1-48, From a viewpoint that the heat resistance of a hardened material carbon numbers 1-10, and it is still more preferred that it is an organic group of bivalence of direct coupling or the carbon numbers 1-4. As the example of these desirable R⁵, [0055]

$$-(CH_2)_n$$
 (式中 n t 1 7 0 $8)$,

 $-\frac{0}{C} - (CH_2)_n$ (式中 n t 0 $-16 0 $8)$),

 $-\frac{0}{C} - (CH_2)_n$ (式中 n t 0 $-16 0 $8)$)

 $-\frac{0}{C} - (CH_2)_n$ (式中 n t 0 $-16 0 $8)$)

 $-\frac{0}{C} - (CH_2)_n$ (式中 n t 0 $-(CH_2)_n$ $-(CH_2)_n$$$$

contain only C, H, and O as a composing element, and it is more preferred that it is a hydrocarbon group of [0056] From a viewpoint that the chemical thermal stability of a hardened material obtained can become bivalence of direct coupling or the carbon numbers 1–48. As the example of these desirable $m R^5, [0.057]$ bivalence of the carbon numbers 1-48 which contain direct coupling or two oxygen atoms or less, and good as R⁵ of the above-mentioned general formula (V). It is preferred that it is an organic group of ** is mentioned. [Formula 23]

—CH,—CH—CH,—0—CH,— --CH3-CH-CH3-0--CH3-Q-G2-C3-C3

[0058]Although ${\sf R}^6$ of the above-mentioned general formula (V) is a hydrogen atom or a methyl group, from a viewpoint that reactivity is good, its hydrogen atom is preferred. Leas. / in the instance of contraction from most and all other 2004 08 95495 Emmand institute and 1008/08/08 btts.//........ indicate on in/ord-Lin/tern web ord elipopetur ..=htts.q?d&9F49EuroHibarit on 9008/03/08

formula (I)s, it is required to contain the carbon-carbon double bond which has a SiH group and reactivity [0059]However, also in the desirable example of an organic compound expressed with the above general carbon-carbon double bond which has a SiH group and reactivity from a viewpoint that heat resistance in [at least two] one molecule. It is more preferred that it is an organic compound which contains the may be improved more in [three or more] one molecule.

[0060]As a desirable example of an organic compound expressed with the above general formula (I)s, it is

triallyl isocyanurate, [0061]

[0062] From the viewpoint of having the (B) ingredient and good compatibility, and a viewpoint of being hard to produce the problem of the outgas from encapsulant that the volatility of the (A) ingredient can become reactivity in [at least two] one molecule, and a reactant with the chain and/or annular organopolysiloxane (beta) which have a SiH group are also preferred. compounds chosen from the organic compound which contains the carbon-carbon double bond which has ow. (A) A SiH group which was described above as an example of an ingredient, one or more sorts of

(beta) (ingredient)

(beta) An ingredient is a chain and/or annular polyorganosiloxane which has a SiH group.

[0063]concrete — for example [0064]

Formula 25]

$$\begin{array}{cccc} & \text{CH}_3 & \text{CP}_4 & \text{CH}_3 \\ \text{CH}_3 - 5 & \text{i} - 0 + 5 & \text{i} - 0 + 5 & \text{i} - \text{CH}_3 \\ \text{CH}_3 & \text{H} & \text{A} & \text{CH}_3 & \text{(} n = 3 \sim 1 \ 0 \ 0 \) \end{array}$$

[Formula 26]

m=1~1000, n=0~1000)

(m=1~1000, n=0~1000)

 $(n=1 \sim 1000)$ $(n=1 \sim 1000)$

 $(n=3\sim10)$

[0066] From a viewpoint that the compatibility of a SiH group and the organic compound which contains the carbon-carbon double bond which has reactivity in [at least two] one molecule becomes good easily here to following general formula (II)

Formula 27] 0067

(among a formula, R^2 expresses the organic group of the carbon numbers 1–6, and n expresses the number of 3-10.) — the annular polyorganosiloxane which is expressed and which has at least three SiH groups in [0068]As for substituent R^2 in a compound expressed with general formula (II), it is preferred that it is what

comprises C, H, and O, it is more preferred that it is a hydrocarbon group, and it is still more preferred that:

[0070]A thing [a thing] described above and which are independent, or mixes two or more sorts of things, 0069]From acquisition ease etc., it is preferred that it is 1, 3, 5, and 7-tetramethyl cyclotetrasiloxane. and is used is possible for an ingredient in some numbers (beta).

nvention, A case where a compound which can obtain an organic compound and an ingredient (beta) which contain a carbon-carbon double bond which has a SiH group and reactivity in [at least two] one molecule compound and an ingredient (beta) which contain a carbon-carbon double bond which has a SiH group and As (a reaction of a SiH group, an organic compound which contains a carbon-carbon double bond which nas reactivity in [at least two] one molecule, and an ingredient (beta)), next a (A) ingredient of this by the ability to carry out a hydrosilylation reaction is used, A hydrosilylation reaction of an organic reactivity in [at least two] one molecule is explained.

carbon-carbon double bond which has a SiH group and reactivity in [at least two] one molecule is carried [0071]When the hydrosilylation reaction of an organic compound and an ingredient (beta) which contain a out, a mixture of two or more compounds containing the (A) ingredient of this invention may be obtained, but. Without separating the (A) ingredient from there, it can use with a mixture and a hardenability constituent of this invention can also be created.

contain a carbon-carbon double bond which has a SiH group and reactivity in [at least two] one molecule molecule, it is preferred that a ratio with a total (Y) of a SiH group in an ingredient (beta) to mix is X/Y>=2, and it is more preferred that it is X/Y>=3. From a point that compatibility with the (B) ingredient of the (A) double bond which has reactivity in [at least two] one molecule, and an ingredient (beta), In a point that [0072]A case where the hydrosilylation reaction of an organic compound and an ingredient (beta) which gelling under reaction can be controlled although not limited in particular, Total (X) of a carbon-carbon ingredient becomes good easily, it is preferred that it is 10 $\geq X/Y$ and it is more preferred that it is 5 is carried out. The mixing ratio of a SiH group, an organic compound which contains a carbon-carbon compound which contains a carbon-carbon double bond which has reactivity in [at least two] one double bond which generally has the reactivity of a SiH group to mix and a SiH group in an organic

which made carriers, such as a simple substance of platinum, alumina, silica, and carbon black, support solid compound and an ingredient (beta) which contain a carbon-carbon double bond which has a SiH group and [P(OPh) $_3$] -) [$_4$ and] Pt[P(OBu) $_3$] $_4$ (among a formula, a methyl group and Bu express a butyl group, Vi phosphine complex. (For example, $Pt(PPh_3)_4$, $Pt(PBu_3)_4$), a platinum-phosphite complex (for example, Ptplatinum, A complex with chloroplatinic acid, chloroplatinic acid, alcohol, aldehyde, ketone, etc., Platinumreactivity in [at least two] one molecule. As a catalyst, the following can be used, for example. A thing olefin complex (for example, it $Pt(CH_2^-=-CH_2^-)-\frac{(PPh_3)}{2}$ and) $Pt(CH_2^=CH_2)$ $_2Cl_2$. Platinum-vinyl 0073]A suitable catalyst may be used when carrying out the hydrosilylation reaction of an organic siloxane complex (for example, it Pt(ViMe-2-SiOSiMe-2 Vi)-, and) Pt[(MeViSiO) 4] m, a platinum-

mentioned. A platinum chloride-olefin complex indicated in a U.S. Pat. No. 3516946 specification of Modic 0.074]As an example of catalysts other than a platinum compound, RhCl(PPh) $_3$, RhCl $_3$, RhAl $_2$ O $_3$, RuCl $_3$, expresses a vinyl group, Ph expresses a phenyl group as for Me, and n and m) An integer is shown. A catalyst, U.S. Pat. No. 3159601 of Ashby (Ashby), and the No. 3159662 specification, And a platinum platinum-hydrocarbon complex indicated in dicarbonyl dichloroplatinum, a curl SHUTETO (Karstedt) alcoholate catalyst indicated in a U.S. Pat. No. 3220972 specification of RAMORO (Lamoreaux) is (Modic) is also useful in this invention.

IrCl₃, FeCl₃, AlCl₃, PdCl₂and2H₂O, NiCl₂, TiCl₄, etc. are mentioned.

preferred from a point of catalytic activity. These catalysts may be used alone and may be used together [0075]In these, chloroplatinic acid, a platinum-olefin complex, a platinum-vinyl siloxane complex, etc. are

[0076]Although an addition in particular of a catalyst is not limited, in order to have sufficient hardenability and to hold down cost of a hardenability constituent comparatively low a minimum of a desirable addition, (beta) as opposed to 1 mol of SiH groups of an ingredient $^{-1}$ 10 $^{-8}$ mol $^{-1}$ are 10 $^{-6}$ mol more preferably

contains a carbon-carbon double bond which has a SiH group in a case of making it react, and reactivity in catalyst is not limited / 1 mol of hydrosilylation catalysts] of a desirable addition -- 10 $^{-2}$ mol -- it is 10 $^-$ (beta). (beta) Since it has moisture and reactivity which an ingredient is mixing under existence (beta) of a systems compounds, such as sulfur of acetylene alcohol system compounds, such as 1, such as dimethyl maleate, 2-diester system compound, and a 2-hydroxy-2-methyl-1-butyne, and a simple substance, and triethylamine, etc. are mentioned. a minimum [as opposed to / although an addition in particular of a cowhat mixed a catalyst to an organic compound which contains a carbon-carbon double bond which has a bond which has a SiH group and reactivity in [at least two] one molecule, and a mixture of an ingredient case of a method of mixing a catalyst into an organic compound which contains a carbon-carbon double [at least two] one molecule, an ingredient (beta), and a catalyst, A method of mixing ****** (beta) for SiH group and reactivity in [at least two] one molecule is preferred. Control of a reaction is difficult in bond which has a SiH group and reactivity in what mixed a catalyst with an ingredient in [at least two] [0077]]t is possible to use a co-catalyst together for the above-mentioned catalyst, and as an example mol more preferably — a maximum of a desirable addition — 10 2 mol — it is 10 mol more preferably. catalyst when taking a method of mixing an organic compound which contains a carbon-carbon double The Lynn system compounds, such as triphenyl phosphine, Amine system compounds, such as sulfur-(0078) Although various methods can be taken as the method of mixing of an organic compound which one molecule, it may deteriorate.

react will become long if reaction temperature is low, and reaction temperature is high. Although a reaction temperature requirement are 150 ** more preferably. It is not practical if reaction time for making it fully temperature requirement are 50 ** more preferably in this case, and 200 ** of maximums of a desirable 0079]Although many things can be set up as reaction temperature, 30 ** of minimums of a desirable may be performed at a fixed temperature, a multi stage story or per-continuum temperature may be changed if needed.

solvents. As a solvent, toluene, a tetrahydrofuran, 1,3-dioxolane, and chloroform are preferred. The amount [0081]A solvent may be used in the case of a hydrosilylation reaction. A solvent which can be used is not dioxolane and diethylether, acetone, and methyl ethyl ketone,], chloroform, methylene chloride, 1, and 2hydrocarbon system solvents, such as benzene, toluene, hexane, and heptane, Halogen system solvents, such as ketone solvent [, such as ether system solvents, such as a tetrahydrofuran 1, 4-dioxane, 1,3dichloroethane, can be used conveniently. A solvent can also be used as two or more kinds of mixed what is limited especially unless a hydrosilylation reaction is checked, If it illustrates concretely, [0080]A pressure of reaction time and reaction time can also be set up variously if needed. of solvents to be used can also be set up suitably.

oond which has a SiH group and reactivity in [at least two] one molecule react, An organic compound or/, olatilization of volatile matter content, and a crack by removing such volatile matter content in hardening with the (B) ingredient. As a method of removing, processing by activated carbon, aluminum silicate, silica [0083] After making an organic compound and an ingredient (beta) which contain a carbon-carbon double 0084]As an example of the (A) ingredient which is an organic compound and a reactant of an ingredient ngredient obtained does not have volatile matter content, it is hard to produce a problem of a void by decompression devolatilization, processing at low temperature is preferred. A maximum of a desirable and (beta) an ingredient which contain a carbon-carbon double bond which has a solvent or/, and an unreacted SiH group and reactivity in [at least two] one molecule are also removable. Since the (A) gel, etc. besides for example, decompression devolatilization, etc. are mentioned. When carrying out [0082]In addition, various additive agents may be used for the purpose of controlling reactivity etc. temperature in this case is 100 **, and is 60 ** more preferably. If it processes at an elevated temperature, it will be easy to be accompanied by deterioration of thickening etc.

beta) which contain a carbon–carbon double bond which has above SiH groups and reactivity in [at least; Jicyclopentadiene and 1, 3, 5, and 7-tetramethyl cyclotetrasiloxane, A reactant of triallyl isocyanurate, a cyclotetrasiloxane, A reactant of a vinylcyclohexene and 1, 3, 5, and 7-tetramethyl cyclotetrasiloxane, A reactant of divinylbenzene and 1, 3, 5, and 7-tetramethyl cyclotetrasiloxane, A reactant of a :wo] one molecule, A reactant of bisphenol A diaryl ether and 1, 3, 5, and 7-tetramethyl

reactant of 1,3,5,7-tetramethyl cyclotetrasiloxane and diaryl monoglycidyl isocyanurate, and 1, 3, 5, and 7- · tetramethyl cyclotetrasiloxane, etc. can be mentioned. A compound which has a SiH group which are ((B) Ingredient), next the (B) ingredient is explained.

[0085]The (B) ingredient of this invention is a compound which contains at least two SiH groups in one

[0086](B) It is a compound which there will be no restriction especially if it is a compound which contains at least two SiH groups in one molecule about an ingredient, for example, is indicated to international [0087] From a field of availability, it is following general formula (II) further among these from a viewpoint that a chain and/or annular organopolysiloxane which have at least two SiH groups are preferred in one molecule, and compatibility with the (A) ingredient is good for it. publication WO96/15194, and what has at least two SiH groups in one molecule can be used. [0088]

(among a formula, R^2 expresses the organic group of the carbon numbers 1–6, and n expresses the number of 3-10.) — the annular organopolysiloxane which is expressed and which has at least two SiH groups in one molecule is preferred.

[0089]As for substituent R² in the compound expressed with general formula (II), it is preferred that it is what comprises C, H, and O, it is more preferred that it is a hydrocarbon group, and it is still more preferred that it is a methyl group.

[0090]As a compound expressed with general formula (II), it is preferred from a viewpoint of acquisition ease that it is 1, 3, 5, and 7-tetramethyl cyclotetrasiloxane.

[0091](B) Although restrictions in particular do not have a molecular weight of an ingredient and arbitrary molecular weight is used preferably. Specifically the thing of 50-100,000 has a preferred molecular weight, things can use it conveniently, from a viewpoint of being easier to reveal mobility, the thing of low [0092](B) Independent, two or more sorts of things are mixed, and an ingredient can be used. the thing of 50-1,000 is more preferred, and the thing of 50-700 is still more preferred.

[0093](A) From a viewpoint of having an ingredient and good compatibility, and a viewpoint of being hard to An organic compound (alpha) which contains a carbon–carbon double bond in which an ingredient has a SiH group and reactivity in [one or more] one molecule, It is preferred that it is a compound which can obtain produce a problem of outgas from encapsulant that the volatility of the (B) ingredient can become low. (B) a chain and/or annular polyorganosiloxane (beta) which has at least two SiH groups by the ability to carry out a hydrosilylation reaction in one molecule.

molecule which are the above-mentioned (A) ingredients (ingredient). (alpha 1) Crosslinking density of a (alpha) The ingredient (alpha) can also use here the same thing (alpha 1) as a SiH group and an organic hardened material which will be obtained if an ingredient is used becomes high, and dynamics intensity compound which contains a carbon-carbon double bond which has reactivity in [at least two] one serves as reliable high encapsulant easily.

be obtained if an ingredient is used serves as low elasticity easily, and serves as reliable encapsulant easily [0094]In addition, an organic compound (alpha 2) which contains a carbon-carbon double bond which has a SiH group and reactivity in [one] one molecule can also be used. (alpha 2) A hardened material which will

copolymer or a polysiloxane organicity graft copolymer as a compound, and contains only C, H, N, O, S, and (alpha 2) Especially if it is an organic compound which contains as an ingredient a carbon-carbon double (ingredient) (B) In a point that the (A) ingredient and compatibility become good in an ingredient, It is preferred that it is what does not include siloxane units (Si-O-Si) like polysiloxane organicity block bond which has a SiH group and reactivity in { one } one molecule, will not be limited, but (alpha 2). halogen as a composing element.

[0095](alpha 2) A SiH group of an ingredient and a connecting position in particular of a carbon¬carbon double bond which has reactivity are not limited, but may exist anywhere in intramolecular.

[0096](alpha 2) A compound of an ingredient can be classified into a compound and a monomer system compound of a polymer system.

[0097]As a polymer system compound, for example, a polysiloxane system, a polyether system, A compound of a polyester system, a polyarylate system, a polycarbonate system, a saturated hydrocarbon system, an unsaturation hydrocarbon system, a polyacrylic ester system, a polyamide system, a polyamide system, a polyamide system bhenolendinesin system), and a polyimide system can be used.

[0098]As a monomer system compound, a compound of aliphatic hydrocarbon system:heterocyclic systems, such as aromatic hydrocarbon system:straight chain systems, such as a phenol system, a bisphenol system, benzene, and naphthalene, and an alicycle system, compounds of a silicon system, these mixtures, etc. are mentioned.

[0099](alpha 2) Although not limited especially as a carbon-carbon double bond which has a SiH group of an ingredient, and reactivity, it is following general formula (III).

[0100] [Formula 29]

(111)

 $(R^3$ in a formula expresses a hydrogen atom or a methyl group.) — the basis shown is preferred from a reactant point. From the ease of acquisition of a raw material, [0101]

[Formula 30] H

Especially the basis shown is preferred.

[0102](alpha 2) As a carbon-carbon double bond which has a SiH group of an ingredient, and reactivity, it is

following general formula (IV). [0103]

Formula 31]

.

 \mathbb{R}^4 in a formula expresses a hydrogen atom or a methyl group.) — an alicyclic basis shown is preferred from a point that the heat resistance of a hardened material is high. From an ease of acquisition of a raw

material, [0104] [Formula 32]

Especially the alicyclic basis shown is preferred.

[0105]The carbon-carbon double bond which has a SiH group and reactivity may be coupled directly with the skeletal part of an ingredient (alpha 2), and the covalent bond may be carried out via the substituent more than divalent. Especially if it is a substituent of the carbon numbers 0–10 as a substituent more than divalent, it will not be limited, but that in which the (B) ingredient contains only C, H, N, O, S, and halogen as a composing element in the point that the (A) ingredient and compatibility become good easily is preferred. As the example of these substituents, [0106]

Formula 33]

3

(nは1~10の数を表す。) ,

(nは0~4の数を表す。)

Formula 34]

(nは0~4の数を扱す。)

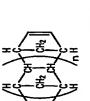
**************. Two or more of the substituents more than divalent [these] are connected by a covalent bond, and they may constitute the substituent more than divalent [one].

[0108]As an example of the basis which carries out a covalent bond to the above skeletal parts, A vinyl group, an allyl group, a metallyl group, an acrylic group, an methacrylic group, a 2-hydroxy-3-(allyloxy) propyl group, 2-allyl phenyl group, 4-allyl phenyl group, 4-allyl phenyl group, A 2-(allyloxy) phenyl group, 3-(allyloxy) phenyl group, 2-(allyloxy) phenyl group, 2-(allyloxy) ethyl group, 2, and 2-bis(aryloxymethyl)butyl group, the 3-allyloxy 2, a 2-bis(aryloxymethyl)propyl group, [0109]

JP,2003-261 / /U,A [DE | AILED DESCKIP | ION]

— (cH-CH2-0)-1CH2-CH=CH2

(nは5≧n≧2を満足する数を設す。),



(nは0~4の数を表す。)

popologica de la composição de la compos

compounds, such as o-allylphenol, monoallyl dibenzyl isocyanurate, Silicon compounds, such as substitution oxide and piece end arylation polypropylene oxide, Polymer or oligomer etc. which has a vinyl group can be heptene, 1-octene, 1-nonene, 1-decene, 1-dodecen, 1-undecene, Lini Allen by an Idemitsu petrochemical glycol monoallyl ether, and 4-vinyl-1,3-dioxolane 2-one, 1,2-dimethoxy− 4-allylbenzene, Aromatic system methylcyclohexene, methylenecyclohexane, NORUBORUNIREN, ethylidenecyclohexane, vinylcyclohexane, vinyltriphenylsilane, etc. are mentioned. Polyether system resin, such as piece end arylation polyethylene system compounds, such as allylbenzene and a 4-phenyl-1-butene, Aliphatic series system compounds, socyanurate, such as monoallyl diglycidyl isocyanurate, vinyl trimethylsilane, vinyltrimetoxysilane, and a sinene. Styrene, alpha methylstyrene, indene, phenylacetylene, 4-ethynyltoluene, Aromatic hydrocarbon [0110](alpha 2) As a concrete example of an ingredient, a propene, 1-butene, 1-pentene, 1-hexene, 1such as allyl ether [, such as alkyl allyl ether and allylphenyl ether], glycerin monoallyl ether, ethylene company, 4,4-dimethyl- 1-pentene, A 2-methyl-1-hexene, a 2,3,3-trimethyl 1-butene, Chain aliphatic mentioned to piece ends, such as acrylic resin, such as hydrocarbon system resin, such as piece end Annular aliphatic hydrocarbon system compounds, such as camphene, Caren, alpha pinene, and beta nydrocarbon system compounds, such as 2, 4, and 4-trimethyl 1-pentene. A cyclohexene, a arylation polyisobutylene, piece end arylation poly butyl acrylate, and piece end arylation polymethylmethacrylate.

[0111]A line or a letter of branching may be sufficient as structure, restrictions in particular do not have a molecular weight and it can use various things. In a point that viscosity of a mixture becomes low and a moldability becomes good easily although molecular weight distribution in particular does not have restriction, either, it is preferred that molecular weight distribution is three or less, it is more preferred that t is 1.5 or less.

[0112] (alpha 2) When glass—transition temperature of an ingredient exists, there is no limitation in particular also about this, and various things are used, but. In a point that a hardened material obtained becomes tough easily, as for glass point transfer temperature, it is preferred that it is 100 ** or less, it is more preferred that it is 50 ** or less, and it is still more preferred that it is 0 ** or less, Poly butyl acrylate resin etc. are mentioned as an example of desirable resin. Conversely, in a point that the heat resistance of a hardened material obtained becomes high, as for glass—transition temperature, it is preferred that it is not less than 100 **, it is more preferred that it is not less than 120 **, it is still more preferred that it is not

less than 150 **, and it is most preferred that it is not less than 170 **. It can ask for glass∹transition temperature as a temperature tandelta indicates the maximum to be in dynamic viscoelasticity

measurement. [0113](alpha 2) In a point that the heat resistance of a hardened material obtained becomes high as an

ingredient, it is preferred that it is a hydrocarbon compound. In this case, a minimum of a desirable carbon number is 7 and a maximum of a desirable carbon number is 10.

[0114](alpha 2) As an ingredient, it may have other reactant groups. As a reactant group in this case, an epoxy group, an amino group, a radical polymerization nature unsaturation group, a carboxyl group, an isocyanate group, hydroxyl, alkoxy silyl groups, etc. are mentioned. When it has these functional groups, intensity of a hardened material obtained by the adhesive property of a hardenability constituent obtained becoming high easily becomes high easily. From a point that an adhesive property can become higher, an epoxy group is preferred among these functional groups. In a point that the heat resistance of a hardened material obtained becomes high easily, it is preferred to average a reactant group and to have in [one or more] one molecule. Specifically, monoallyl diglycidyl isocyanurate, allyl glycidyl ether, allyloxy ethyl methacrylate, allyloxy ethyl

[0115]A single thing may be used as above (alpha 2) ingredients, and it may use combining two or more things.

(beta) An ingredient is a chain and/or annular polyorganosiloxane which has at least two SiH groups in one molecule (beta). (ingredient)

[0116]concrete — for example [0117]

[Formula 36]

$$\begin{array}{cccc} c_{H_3} - c_{H_3} & c_{H_3} \\ c_{H_3} - c_{I_3} - c_{I_3} - c_{I_3} & c_{H_3} \\ c_{H_3} & H & A & C_{H_3} & (n = 3 \sim 1000), \end{array}$$

$$\begin{array}{cccc} c_{H_3} & \left(c_{e^{H_5}}\right) & c_{H_3} & c_{H_3} \\ c_{H_3} - s_{1-0} + s_{1-0} + s_{1-0} + s_{1-0} \\ c_{H_3} & \left(H_3 - s_{1-0} + s_{1-0} +$$

[0118] [Formula 37]

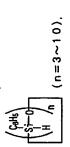
$$(m=1\sim1000, n=0\sim1000)$$

$$(m=1\sim1000, n=0\sim1000)$$

$$\begin{array}{c} \rho_{13} & \rho_{14} \\ H-S^+=0 \left\{ \begin{array}{l} S^+=0 \\ S^+=0 \end{array} \right\} \\ \rho_{13} & \rho_{14} \\ \rho_{14} & \rho_{14} \\ \rho_{14} & \rho_{14} \\ \rho_{15} & \rho_{14} \\ \rho_{15} & \rho_{15} \\ \rho_{1$$

$$\begin{array}{c} CH_{3} \\ CH_{3} \\ CH_{3} \\ CH_{4} \\ CH_{5} \\ CH_{5$$

$$\begin{pmatrix} cH_3 \\ H \\ H \end{pmatrix} \quad (n = 3 \sim 1.0).$$



[0119]From a viewpoint that compatibility with an ingredient (alpha) becomes good easily here to following general formula (II) [0120] [Formula 38]

$$\begin{pmatrix} R^6 \\ Si \to 0 \\ H & A \end{pmatrix}$$
 (II)

(among a formula, \mathbb{R}^2 expresses the organic group of the carbon numbers 1–6, and n expresses the number of 3–10.) — the annular polyorganosiloxane which is expressed and which has at least three SiH groups in one molecule is preferred.

[0121]As for substituent \mathbb{R}^2 in a compound expressed with general formula (II), it is preferred that it is what comprises \mathbb{C} , \mathbb{H} , and \mathbb{O} , it is more preferred that it is a hydrocarbon group, and it is still more preferred that

it is a methyl grour

[0122]From acquisition ease etc., it is preferred that it is 1, 3, 5, and 7-tetramethyl cyclotetrasiloxane. [0123]A thing [a thing] described above and which are independent, or mixes two or more sorts of things, and is used is possible for an ingredient in some numbers (beta).

A hydrosilylation reaction of an ingredient (alpha) and an ingredient (beta) in a case of using a compound which can obtain an ingredient (alpha) and an ingredient (beta) by the ability to carry out a hydrosilylation reaction as ((alpha) a reaction of an ingredient and an ingredient (beta)), next a (B) ingredient of this invention is explained.

[0124]When the hydrosilylation reaction of an ingredient (alpha) and the ingredient (beta) is carried out, a mixture of two or more compounds containing the (B) ingredient of this invention may be obtained, but without separating the (B) ingredient from there, it can use with a mixture and a hardenability constituent of this invention can also be created.

[0125](alpha) The mixing ratio of an ingredient (alpha) in a case of carrying out the hydrosilylation reaction of an ingredient and the ingredient (beta), and an ingredient (beta), Although not limited in particular, when intensity of a hardened material by hydrosilylation with the (B) ingredient and the (A) ingredient which are obtained is considered, since a direction with many SiH groups of the (B) ingredient is preferred, it is preferred that a ratio with a total (Y) of a SiH group in an ingredient (beta) mixed with total (X) of a carbon-carbon double bond which has reactivity with a SiH group in an ingredient (alpha) generally mixed is Y/X>=2, and it is more preferred that it is Y/X>=3. From a point that compatibility with the (A) ingredient of the (B) ingredient becomes good easily, it is preferred that it is 10 >=Y/X and it is more preferred that it is 5 >=Y/X.

[0126](alpha) A suitable catalyst may be used when carrying out the hydrosilylation reaction of an ingredient and the ingredient (beta). As a catalyst, the following can be used, for example. A thing which made carriers, such as a simple substance of platinum, alumina, silica, and carbon black, support solid platinum, A complex with chloroplatinic acid, chloroplatinic acid, alcohol, aldehyde, ketone, etc., Platinumolefin complex (for example, it $Pt(CH_2-Z-CH-2)^2$, $(PPh^{-3})^2$ and $Pt(CH_2=CH_2)^2$, $(PI)^2$, Platinumbloshine complex (for example, it $Pt(PI)^3$, $Pt(PBu_3)^4$, a platinum-phosphite complex (for example, $Pt(PPh_3)^4$, $Pt(PBu_3)^4$, a platinum-phosphite complex (for example, $Pt(PI)^3$, $Pt(PBu_3)^4$, a platinum-phosphite complex (for example, $Pt(PI)^3$, $Pt(PBu_3)^4$, a platinum-phosphite complex indicated in dicarbonyl dichloroplatinum, a curl SHUTETO (Karstedt) catalyst, U.S. Pat. No. 3159601 of Ashby (Ashby), and the No. 3159662 specification, And a platinum alcoholate catalyst indicated in a U.S. Pat. No. 3220972 specification of RAMORO (Lamoreaux) is mentioned. A platinum chloride-olefin complex indicated in a U.S. Pat. No. 3516946 specification of Modic (Modic) is also useful in this invention.

[0127]As an example of catalysts other than a platinum compound, RhCl(PPh) ₃, RhCl₃, RhAl₂O₃, RuCl₃, IrCl₃, FeCl₃, AlCl₃, PdCl₂and2H₂O, NiCl₂, TiCl₄, etc. are mentioned.

[0128]in these, chloroplatinic acid, a platinum-olefin complex, a platinum-vinyl siloxane complex, etc. are preferred from a point of catalytic activity. These catalysts may be used alone and may be used together two or more sorts.

[0129]Although an addition in particular of a catalyst is not limited, in order to have sufficient hardenability and to hold down cost of a hardenability constituent comparatively low a minimum of a desirable addition, (beta) as opposed to 1 mol of SiH groups of an ingredient — 10^{-8} mol — are 10^{-6} mol more preferably and a maximum of a desirable addition receives 1 mol of SiH groups of an ingredient (beta) — 10^{-1} mol — it is 10^{-2} mol more preferably. Here [here] it is possible again to use a co-catalyst together for the above-mentioned catalyst, Amine system compounds, such as sulfur-systems compounds, such as sulfur of acetylene alcohol system compounds, such as 1, such as the Lynn system compounds, such as triphenyl phosphine, and dimethyl maleate, 2-diester system compound, and a 2-hydroxy-2-methyl-1-butyne, and a simple substance, and triethylamine, etc. are mentioned as an example, a minimum [as opposed to / although an addition in particular of a co-catalyst is not limited / 1 mol of hydrosilylation catalysts] of a desirable addition — 10^{-2} mol — it is 10^{-1} mol more preferably — a maximum of a desirable addition —

 10^{2} mol — it is 10 mol more preferably.

[0132]A pressure of reaction time and reaction time can also be set up variously if needed.
[0133]A solvent may be used in the case of a hydrosilylation reaction. A solvent which can be used is not what is limited especially unless a hydrosilylation reaction is checked, If it illustrates concretely, hydrocarbon system solvents, such as benzene, toluene, hexane, and heptane, Halogen system solvents, such as a tetrahydrofuran 1, 4-dioxane, 1,3-dioxolane and diethylether, acetone, and methyl ethyl ketone,], chloroform, methylene chloride, 1, and 2-dichloroethane, can be used conveniently. A solvent can also be used as two or more kinds of mixed solvents. As a solvent, toluene, a tetrahydrofuran, 1,3-dioxolane, and chloroform are preferred. The amount of solvents to be used can also be set up suitably.

may be performed at a fixed temperature, a multi stage story or per-continuum temperature may be

[0134]In addition, various additive agents may be used for the purpose of controlling reactivity etc. [0135](alpha) After making an ingredient and an ingredient (beta) react, a solvent or/and an unreacted (alpha) ingredient or/, and (beta) an ingredient are also removable. Since the (B) ingredient obtained does not have volatile matter content, it is hard to produce a problem of a void by volatilization of volatile matter content, and a crack by removing such volatile matter content in hardening with the (A) ingredient. As a method of removing, processing by activated carbon, aluminum silicate, silica gel, etc. besides for example, decompression devolatilization, etc. are mentioned. When carrying out decompression devolatilization, etc. are mentioned. A maximum of a desirable temperature in this case is 100 ** and is 60 ** more preferably. If it processes at an elevated temperature, it will be easy to be accompanied by deterioration of thickening etc.

[0136]As an example of the (B) ingredient which is a reactant of above ingredients (alpha) and ingredients (beta). A reactant of bisphenol A diaryl ether and 1, 3, 5, and 7-tetramethyl cyclotetrasiloxane, A reactant of a vinyloyclohexene and 1, 3, 5, and 7-tetramethyl cyclotetrasiloxane, A reactant of divinylbenzene and 1, 3, 5, and 7-tetramethyl cyclotetrasiloxane, A reactant of a dicyclopentadiene and 1, 3, 5, and 7-tetramethyl cyclotetrasiloxane, A reactant of diaryl monoglycidyl isocyanurate and 1, 3, 5, and 7-tetramethyl cyclotetrasiloxane, A reactant of allyl glycidyl ether and 1, 3, 5, and 7-tetramethyl cyclotetrasiloxane, A reactant of allyl glycidyl ether and 1, 3, 5, and 7-tetramethyl cyclotetrasiloxane, A reactant of 1, 3, 5, and 7-tetramethyl cyclotetrasiloxane and monoallyl diglycidyl isocyanurate, and 1, 3, 5, and 7-tetramethyl cyclotetrasiloxane and monoallyl diglycidyl isocyanurate, and 1, 3, 5, and 7-tetramethyl cyclotetrasiloxane, and monoallyl diglycidyl isocyanurate, and 1, 3, 5, and 7-tetramethyl cyclotetrasiloxane, etc. can be mentioned.

(Mixing of the (A) ingredient and the (B) ingredient) About combination of the (A) ingredient and the (B) ingredient, various combination of things quoted as an example of a thing quoted as an example of the (A) ingredient, various combination of things quoted as an example of a thing quoted as an example of the (A) ingredient, and those various mixture ** can be mentioned. [0137](A) In a ratio [as opposed to / the mixing ratio of an ingredient and the (B) ingredient is not limited especially unless required intensity is lost, but / number (X) of a carbon-carbon double bond in the (A) ingredient of the number of SiH groups in the (B) ingredient (Y)], a minimum of a desirable range — Y/X>=0.3 — more — desirable — Y/X>=0.5 — it is Y/X>=0.7 still more preferably — a maximum of a desirable range — 3>=/Y/X — more — desirable — 2>=/Y/X — it is 1.5>=/Y/X still more preferably. When it shifts, sufficient intensity is not obtained or it becomes easy to carry out heat deterioration from a desirable range.

(C) ingredient) A hydrosilylation catalyst which is next the (C) ingredient is explained.

[0138] As a hydrosilylation catalyst, especially if there is catalytic activity of a hydrosilylation reaction, will

3159601 of Ashby (Ashby) and the No. 3159662 specification and a U.S. Pat. No. 3220972 specification of acid, alcohol, aldehyde, ketone, etc., Platinum-olefin complex (for example, it Pt(CH $_2$ -=-CH $_2$) $_2$ (PPh $_3$ and) Pt[(MeViSiO) $_4^{
m J}$ m, a platinum-phosphine complex. (For example, Pt(PPh $_3^{
m J}$ 4, Pt(PBu $_3^{
m J}$ 4, a platinumalumina, silica, and carbon black, support solid platinum, A complex with chloroplatinic acid, chloroplatinic 2 and) Pt(CH₂=CH₂) ₂Cl₂, Platinum-vinyl siloxane complex (for example, it Pt(ViMe-₂-SiOSiMe-₂ Vi)-_n group and Bu express a butyl group, Vi expresses a vinyl group, Ph expresses a phenyl group as for Me, and n and m show an integer.), dicarbonyl dichloroplatinum, and a curl SHUTETO (Karstedt) catalyst. A phosphite complex (for example, Pt [P(OPh) $_3$] —) [$_4$ and] Pt[P(OBu) $_3$] $_4$ (among a formula, a methyl not be limited, but. For example, a thing which made carriers, such as a simple substance of platinum, platinum alcoholate catalyst indicated in a platinum-hydrocarbon complex indicated in U.S. Pat. No. RAMORO (Lamoreaux) is mentioned. A platinum chloride-olefin complex indicated in a U.S. Pat. No. 3516946 specification of Modic (Modic) is also useful in this invention.

0139]As an example of catalysts other than a platinum compound, RhCl(PPh) 3, RhCl₃, RhAl₂O₃, RuCl₃,

rCl₃, FeCl₃, AlCl₃, PdCl₂and2H₂O, NiCl₂, TiCl₄, etc. are mentioned.

preferred from a point of catalytic activity. These catalysts may be used alone and may be used together [0140]in these, chloroplatinic acid, a platinum-olefin complex, a platinum-vinyl siloxane complex, etc. are two or more sorts.

(B) as opposed to 1 mol of SiH groups of an ingredient — 10^{-8} mol — are 10^{-6} mol more preferably and a [0141]Although an addition in particular of a catalyst is not limited, in order to have sufficient hardenability maximum of a desirable addition receives 1 mol of SiH groups of an ingredient (beta) --- 10 -1 mol -- it is and to hold down cost of a hardenability constituent comparatively low a minimum of a desirable addition, 10 -2 mol more preferably.

catalyst is not limited \prime 1 mol of hydrosilylation catalysts] of a desirable addition - 10 $^{-2}$ mol - it is 10 $^$ triethylamine, etc. are mentioned, a minimum [as opposed to / although an addition in particular of a cosystems compounds, such as sulfur of acetylene alcohol system compounds, such as 1, such as dimethyl maleate, 2-diester system compound, and a 2-hydroxy-2-methyl-1-butyne, and a simple substance, and mol more preferably — a maximum of a desirable addition — 10 2 mol — it is 10 mol more preferably. [0142]It is possible to use a co-catalyst together for the above-mentioned catalyst, and as an example The Lynn system compounds, such as triphenyl phosphine, Amine system compounds, such as sulfur-A filler which are ((D) Ingredient), next the (D) ingredient is explained.

clay, clay, talc, calcium carbonate, magnesium carbonate, barium sulfate, and an inorganic balloon, are made crystalline silica and superfines amorphous silica, silicon nitride, Silver dust, alumina, aluminium hydroxide, [0143](D) Although various kinds of things are used as a filler of an ingredient, For example, quartz, fume titanium oxide, glass fiber, carbon fiber, Inorganic fillers, such as mica, carbon black, graphite, diatomite, nto the start, Generally use or/, a filler proposed, etc. can be mentioned as a filler of the conventional silica, sedimentation nature silica, a silicic acid anhydride, fused silica, Silica system fillers, such as

(0144](D) From a viewpoint of being hard to give a damage as a filler of an ingredient to a semiconductor sealing agents, such as an epoxy system.

and an electronic industry material to close, it is preferred that it is low radiation nature. [0145](D) The surface treatment of the filler of an ingredient may be carried out suitably. As a surface reatment, alkylation processing, trimethylsilylation processing, siliconization, processing by a coupling

socyanurate group, a vinyl group, and a carbamate group is preferred, and an epoxy group, an methacrylic an methacrylic group, At least one functional group chosen from an acrylic group, an isocyanate group, an agent. As an organic group and an existing reactant basis, an epoxy group from a point of handling nature, group, and especially an acrylic group are preferred from hardenability and an adhesive point. As a silicon group of hydrolysis nature, a point of handling nature to alkoxy silyl groups is preferred, and especially a methoxy silyl group and ethoxy silyl group is preferred from a reactant point. agent, etc. are mentioned. [0146]A silane coupling agent is mentioned as an example of a coupling agent in this case. It will not be functional group, and at least one silicon group of hydrolysis nature in a molecule as a silane coupling imited especially if it is a compound which has respectively an organic group, an existing reactant

JP,2003-261770,A [DETAILED DESCRIP I IUN]

głycidoxypropyltriethoxysilane, 2-(3, 4-epoxycyclohexyl) ethyltrimethoxysilane, The alkoxysilane which has acryloxyprophyltriethoxysilane, meta-KURIROKISHI methyl trimetoxysilane, The alkoxysilane which has an methacrylic group or acrylic groups, such as meta-KURIROKISHI methyl triethoxysilane, acryloxy methyl epoxy functional groups, such as 2-(3,4-epoxycyclohexyl) ethyltriethoxysilane: 3-methacryloxy propyl trimethoxysilane, 3-methacryloxypropyl triethoxysilane, 3-acryloxyprophyltrimethoxysilane, 3-[0147]As a desirable silane coupling agent, 3-glycidoxypropyltrimetoxysilane, 3trimetoxysilane, and acryloxy methyl triethoxysilane, can be illustrated.

ROKISHIDO, a halogenide, etc. reacting in a constituent or a partial reactant of a constituent, and making a adding to a constituent of this invention, making an alkoxide of metal, such as titanium and aluminum, reed silane monomer or oligomer, such as alkoxysilane, an acyloxy silane, and halogenation Silang. A method of [0148]In addition, a method of adding a filler of the (D) ingredient is mentioned. For example, a hydrolytic

filler generating in a constituent can also be mentioned. [0149]From a viewpoint that are hard to check a hardening reaction among fillers of the above (D) ingredients, and the reduction effect of a coefficient of linear expansion is large, a silica system filler i

[0150](D) In a point that perviousness to a sit of a sealing agent becomes good easily as mean particle diameter of a filler of an ingredient, it is preferred that it is 10 micrometers or less, and it is more preferred

agents, such as an epoxy system, use or/, and a thing proposed are begun, and various setting out of it can be carried out. For example, it may be made for a particle (15 % of the weight or more and 1 micrometer or carries out comparatively, in a point that perviousness to a slit of a sealing agent becomes good easily, it preferred that it is 1 or less % of the weight, and it is more preferred that it is 0.1 or less % of the weight. [0152](D) About particle size distribution of a filler of an ingredient, as a filler of the conventional sealing that it is 5 micrometers or less. [0151](D) If a particle with a particle diameter of not less than 50 micrometers of a filler of an ingredient less) to be 3 % of the weight or more in a not less than 24-micrometer particle.

filler] of not less than 50 micrometers particle can be measured using a laser method micro track grading [0153](D) A rate of a with mean particle diameter of a filler of an ingredient and a particle diameter [of a analysis meter.

agents, such as an epoxy system, use or/, and a thing proposed are begun, and various setting out of it can [0154](D) Also with specific surface area of a filler of an ingredient, as a filler of the conventional sealing [0155]Specific surface area can be measured with a BET adsorption method mono- SOBU surface area be carried out. For example, more than $4-m^2/g$ can set up below $4-m^2/g$ and below $10-m^2/g$ arbitrarily. measuring instrument.

agents, such as an epoxy system, use or/, and a thing proposed are begun, and various setting out of it can be carried out. For example, it can set up arbitrarily not less than 97 etc.% etc. [0157](D) As shape of a filler of an ingredient, it is preferred that it is a spherical filler from a viewpoint to [0156](D) Also with a vitrification rate of a filler of an ingredient, as a filler of the conventional sealing

[0158](D) A filler of an ingredient may be used alone and may be used together two or more sorts. which viscosity of a sealing agent becomes low easily.

viewpoint — from — it is desirable — an addition — a minimum — all — encapsulant — inside — 30 — % [0159](D) Although an addition in particular of a filler of an ingredient is not limited, the reduction effect of of the weight — more — desirable — 50 — % of the weight — it is — it is desirable — an addition — a maximum — all — encapsulant — inside — 80 — % of the weight — more — desirable — 70 — % of the a coefficient of linear expansion is high, and — encapsulant — mobility — being good — saying — a weight — it is .

ingredient, the (C) ingredient, and the (D) ingredient. In a point that the storage stability of an intermediate mixing the (A) ingredient to what mixed the (C) ingredient or/, and the (D) ingredient for an ingredient, (C) material of a sealing agent becomes good easily, what mixed the (C) ingredient and the (D) ingredient for the (A) ingredient, and a method of mixing the (B) ingredient are preferred. (B) When taking a method of Since the (B) ingredient has that of moisture in environment or/, and the (D) ingredient, and reactivity under ingredient existence or/and nonexistence, it may deteriorate in the storage middle class. (Mixing) Although various methods can be taken as the method of mixing of the (A) ingredient, the (B)

additions of a concrete retarder can be set up — 10 ⁻¹ mol — it is 1 mol more preferably — a maximum of [0160]Delay activity is good among these concrete retarders, and a benzothiazole, thiazole, dimethylmalate, benzothiazole disulfide, etc. are illustrated. As a nitrogen containing compound, ammonia, the 1-3rd class (Concrete retarder) A concrete retarder can be used in order to adjust the reactivity of a hydrosilylation containing aliphatic unsaturated bonds are mentioned, and these may be used together. As a compound encapsulant of this invention. As a concrete retarder, a compound, an organophosphorus compound, an organic sulfur compound, a nitrogen containing compound, a tin series compound, organic peroxide, etc. phosphoretted hydrogen, ORGANO Foss John, and trio luganot phosphite are illustrated. As an organic and 3-hydroxy-3-methyl-1-butyne is preferred from a viewpoint that raw material availability is good. containing aliphatic unsaturated bonds, propargyl alcohol, ene-yne compounds, and ester maleate are illustrated. As an organophosphorus compound, Tori ORGANO phosphoretted hydrogen, JIORUGANO sulfur compound, the ORGANO mercaptans, JIORUGANO sulfides, hydrogen sulfide, benzothiazole, a halogenation 2 hydrate, the first tin of carboxylic acid, etc. are illustrated. As organic peroxide, di-treaction in the purpose of improving the preservation stability of **, or a manufacturing process to [0161]a minimum of a desirable addition to 1 mol of hydrosilylation catalysts used although various alkylamine, arylamines, urea, hydrazine, etc. are illustrated. As a tin series compound, first tin of butylperoxide, dicumyl peroxide, benzoyl peroxide, perbenzoic acid t-butyl, etc. are illustrated. a desirable addition — 10 ³ mol — it is 50 mol more preferably.

(Adhesive improving agent) An adhesive improving agent can also be added in encapsulant of this invention. agents, An epoxy compound, phenol resin, coumarone-indene resin, rosin ester resin, terpene phenol resin, a alpha-methylstyrene vinyltoluene copolymer, polyethylmethylstyrene, aromatic polyisocyanate, etc. can Everything but adhesives generally used as an adhesive improving agent, for example, various coupling [0162]These concrete retarders may be used alone and may be used together two or more sorts.

point of handling nature to alkoxy silyl groups is preferred, and especially a methoxy silyl group and ethoxy compound which has respectively an organic group, an existing reactant functional group, and at least one existing reactant basis, an epoxy group from a point of handling nature, an methacrylic group, At least one functional group chosen from an acrylic group, an isocyanate group, an isocyanurate group, a vinyl group, and a carbamate group is preferred, and an epoxy group, an methacrylic group, and especially an acrylic group are preferred from hardenability and an adhesive point. As a silicon group of hydrolysis nature, a [0163]A silane coupling agent is mentioned as a coupling agent. It will not be limited especially if it is a silicon group of hydrolysis nature in a molecule as a silane coupling agent. As an organic group and an silyl group is preferred from a reactant point.

[0164]As a desirable silane coupling agent, 3-glycidoxypropyltrimetoxysilane, 3-glycidoxypropyltriethoxysilane, 2-(3, 4-epoxycyclohexyl) ethyltrimethoxysilane, The alkoxysilane which has acryloxyprophyltriethoxysilane, meta-KURIROKISHI methyl trimetoxysilane, The alkoxysilane which has an methacrylic group or acrylic groups, such as meta-KURIROKISHI methyl triethoxysilane, acryloxy methyl epoxy functional groups, such as 2-(3,4-epoxycyclohexyl) ethyltriethoxysilane: 3-methacryloxy propyl trimethoxysilane, 3-methacryloxypropyl triethoxysilane, 3-acryloxyprophyltrimethoxysilane, 3trimetoxysilane, and acryloxy methyl triethoxysilane, can be illustrated.

[0166]As an epoxy compound, for example A novolac phenol type epoxy resin, A biphenyl type epoxy resin, addition to [ingredient + $(ar{B})$ (A) ingredient] 100 weight section are three weight sections more preferably 1 preferably 50 weight sections. If there are few additions, the adhesive improvement effect will not appear, (3,4-epoxycyclohexyl)horse mackerel peat, screw 1,2-cyclopropanedicarboxylate glycidyl ester, triglycidyl [0167]Although many things can be set up as an addition of an epoxy compound, minimums of a desirable dicyclopentadiene type epoxy resin, Bisphenol F diglycidyl ether, bisphenol A diglycidyl ether, 2,2-bis(4-Vinylcyclohexene dioxide, 2-(3,4-epoxycyclohexyl)-5,5-spiro(3,4-epoxy cyclohexane)-1,3-dioxane, A bis but if there are many additions, it may have an adverse effect on hardened material physical properties. isocyanurate, monoallyl diglycidyl isocyanurate, diaryl monoglycidyl isocyanurate, etc. can be mentioned. głycidyloxy cyclohexyl)propane, 3,4-epoxycyclohexylmethyl 3,4-epoxy cyclohexane carbo KISHIRETO. desirable addition to [ingredient + (B) (A) Ingredient] 100 weight section are 0.5 weight sections more [0165]Although many things can be set up as an addition of a silane coupling agent, minimums of a preferably 0.1 weight sections, and maximums of a desirable addition are 25 weight sections more

sections. If there are few additions, the adhesive improvement effect will not appear, but if there are many_ weight section, and maximums of a desirable addition are 25 weight sections more preferably 50 weight additions, it may have an adverse effect on hardened material physical properties.

[0168]These coupling agents, a silane coupling agent, an epoxy compound, etc. may be used alone, and may

[0169]In order to heighten an effect of a coupling agent or an epoxy compound in this invention, a silanol be used together two or more sorts.

addition are 30 weight sections more preferably 50 weight sections. If there are few additions, the adhesive [0170]Although various the amount of [in case used of using a silanol condensation catalyst] can be set up, A minimum of a desirable addition to a coupling agent or/, and epoxy compound epoxy compound 100 diisopropoxide, aluminum tris (ethylacetoacetate). The aluminum chelate M (the Kawaken Fine Chemicals and aluminum chelate is more preferred from a point of handling nature. As a titanium system compound (acetylacetonate) and an aluminum monoacetyl acetonate screw (ethylacetoacetate), can be illustrated, weight section is one weight section more preferably 0.1 weight sections, and maximums of a desirable acetylacetonato, such as tetraisopropoxy titanium and tetrabutoxytitanium;. A general titanate coupling Although not limited especially as such a silanol condensation catalyst, an aluminum system compound and/, or a titanium system compound is preferred. As an aluminum system compound used as a silanol condensation catalyst can be used further and adhesive improvement and/, or stabilization is possible. improvement effect will not appear, but if there are many additions, it may have an adverse effect on used as a silanol condensation catalyst. Titanium chelate, such as tetraalkoxy titanium.titanium tetra condensation catalyst, Aluminum TORIISO propoxide, sec-butoxyaluminum JIISOFUROPOKISHIDO, Aluminum alkoxides, such as aluminum NIUMUTORI sec-butoxide :. Ethylacetoacetate aluminium make, alkyl acetoacetate aluminium diisopropoxide). Aluminum chelate, such as aluminum tris agent which has residue, such as oxyacetic acid and ethylene glycol, can be illustrated.

[0171]These silanol condensation catalysts may be used alone and may be used together two or more hardened material physical properties.

[0172]In order to heighten the adhesive improvement effect further in this invention, a source compound of diphenyldihydroxysilane, diphenyldimethoxysilane, a tetramethoxy silane, and methyl trimetoxysilane, can be a silanol can be used further and adhesive improvement and/, or stabilization is possible. As such a source of a silanol, alkoxysilane, such as silanol compounds, such as a triphenylsilanol and a

addition are 30 weight sections more preferably 50 weight sections. If there are few additions, the adhesive [0173]Although various the amount of [in case used of using a source compound of a silanol] can be set up, A minimum of a desirable addition to a coupling agent or/, and epoxy compound epoxy compound 100 weight section is one weight section more preferably 0.1 weight sections, and maximums of a desirable improvement effect will not appear, but if there are many additions, it may have an adverse effect on mentioned, for example.

[0174]These source compounds of a silanol may be used alone, and may be used together two or more hardened material physical properties.

[0175]in order to heighten an effect of a coupling agent or an epoxy compound in this invention, carboxylic acid or/, and acid anhydrides can be used, and adhesive improvement and/, or stabilization is possible. Although not limited especially as such carboxylic acid and acid anhydrides, [0176] [Formula 39]

сн3 { сн2 } роон , ноос { сн2 } роон

dicarboxylic acid, hydrogenation methyl NAJIKKU acid, Maleic acid, acetylene dicarboxylic acid, lactic acid, malic acid, citrate, tartaric acid, benzoic acid, hydroxybenzoic acid, cinnamic acid, phthalic acid, trimellitic 2-ethylhexanoic acid, cyclohexane carboxylic acid, cyclohexanedicarboxylic acid, Methylcyclohexane acid, pyromellitic acid, naphthalene carboxylic acid, naphthalene dicarboxylic acid and independent dicarboxylic acid, tetrahydrophtal acid, methyl tetrahydrophtal acid, Methyl himic acid, norbornene those], or a compound acid anhydride is mentioned.

carboxylic acid or/, and acid anhydrides, and has a SiH group and reactivity in a point of being hard to spoil [0177]A thing containing a carbon-carbon double bond which has hydrosilylation reactivity among these oossibility of ** is acquired few is preferred, as desirable carboxylic acid or/, and acid anhydrides — for the physical properties of a hardened material in which it oozes from a hardened material and the

example [0178] Formula 40

CHr=CH+CHr+c00H (nは0~30の数を表す。)

Fetrahydrophtal acid, methyl tetrahydrophtal acid and independent [those], or a compound acid anhydride

[0179]Although various the amount of [in the case used of using carboxylic acid or/, and acid anhydrides]can be set up, The minimum of a desirable addition to a coupling agent or/, and epoxy compound epoxy

compound 100 weight section is one weight section more preferably 0.1 weight sections, and the maximums additions, the adhesive improvement effect will not appear, but if there are many additions, it may have an of a desirable addition are ten weight sections more preferably 50 weight sections. If there are few adverse effect on hardened material physical properties.

[0180]These carboxylic acid or/, and acid anhydrides may be used alone, and they may be used together two or more sorts.

(Thermosetting resin) It is the purpose of reforming the characteristic to encapsulant of this invention, and cyanate ester resin, phenol resin, polyimide resin, urethane resin, a bismaleimide resin, etc. are illustrated, it is also possible to add various thermosetting resin. As thermosetting resin, although an epoxy resin, a is not limited to this. A viewpoint of excelling in the practical use characteristics, such as an adhesive property, to an epoxy resin is [among these] preferred.

0181]As an epoxy resin, for example A novolac phenol type epoxy resin, A biphenyl type epoxy resin,

http://www.d.indlinnit.go.in/rai-hin/tran wah rai alia?atw 1=httn%3A%9F%9Fwwwd.indlinnit.go 2008/03/06

(3,4-epoxycyclohexyl)horse mackerel peat, screw 1,2-cyclopropanedicarboxylate glycidyl ester, Triglycidyl Vinylcyclohexene dioxide, 2-(3,4-epoxycyclohexyl)-5,5-spiro(3,4-epoxy cyclohexane)-1,3-dioxane, A bis dicyclopentadiene type epoxy resin, Bisphenol F diglycidyl ether, bisphenol A diglycidyl ether, 2,2'-bis(4isocyanurate, monoallyl diglycidyl isocyanurate, What stiffens epoxy resins, such as diaryl monoglycidyl głycidyloxy cyclohexyl)propane, 3,4-epoxycyclohexylmethył 3,4-epoxy cyclohexane carbo KISHIRETO, socyanurate, with aliphatic acid anhydrides, such as hexahydro phthalic anhydride,

methylhexahydrophthalic anhydride, trialkyl tetrahydro phthalic anhydride, and a hydrogenation methyl NAJIKKU acid anhydride, is mentioned. These epoxy resins or hardening agents may be used independently, respectively, or may combine two or more things.

as an adhesive property, if there are few additions is hard to be acquired, and if there are many additions, it more — desirable — 30 — % of the weight — it is . An effect which will be made into the purposes, such whole — five — % of the weight — more — desirable — ten — % of the weight — it is — it is desirable the amount used — a maximum — hardenability — a constituent — inside — 50 — % of the weight although — it is desirable — the amount used — a minimum — hardenability — a constituent — the 0182]thermosetting resin — an addition — ***** — especially — limitation — there is nothing will be easy to become weak.

dissolved in the (A) ingredient or/, and the (B) ingredient, and it may mix uniformly using a solvent etc., and material obtained becomes transparence easilier, it is preferred to melt in the (A) ingredient or/, and the [0184]It may melt in the (Å) ingredient or/, and the (B) ingredient, and may mix as a uniform state, resin mixes to a solvent, and heat-curing resin is good also as a dispersion state. In a point that a hardened raw materials or/, and a stiffened thing may be ground, and it may mix by a particle state, it melts and (B) ingredient, and to mix as a uniform state. Also in this case, thermosetting resin may be directly is good also as a uniform dispersion state or/, and the mixed state except for a solvent after that [0183] These thermosetting resin may be used independently or may combine two or more things.

methyl methacrylate and other monomers, Polymethylmethacrylate system resin, such as a block or a graft bis(4–(2–hydroxyethoxy) phenyl)fluorene, and a diethylene glycol, Polyester system resin, such as polyester to which the polycondensation of phthalic acid and aliphatic dicarboxylic acid, such as isophthalic acid, was carried out (for example, O-PET by Kanebo, Ltd., etc.), Polyether sulfone resin, polyarylate resin, polyvinylmonomer structure (for example, APEC by Teijin, Ltd., etc.), A norbornene derivative, a vinyl monomer, etc. Resin which it was independent or carried out copolymerization, Cycloolefin system resin, such as resin to constituent becomes it is low and good [a moldability] easily, it is preferred that a coefficient of variation encapsulant of this invention, and it is also possible to add various thermoplastics. Although various things ethylene, and a copolymer of maleimide, bisphenol A, Diol, terephthalic acid, such as bisphenols, such as a up, but a minimum of desirable mean particle diameter is 10 nm, and a maximum of desirable mean particle distribution or may have two or more peak particle sizes, from a viewpoint that viscosity of a hardenability polypropylene resin, polystyrene resin, polyamide resin, silicone resin, a fluoro-resin, etc. are illustrated, it [0185]When making it distribute and using thermosetting resin, various mean particle diameter can be set thing, Olefin maleimide system resin (for example, TI-PAS by TOSOH CORP., etc.), such as (for example, diameter is 10 micrometers. Although there may be distribution of a particle system, and it may be single acetal resin, Although crude rubber and rubber-like resin called EPDM besides being polyethylene resin, of particle diameter is 10% or less. (Thermoplastics) It is the purpose of reforming the characteristic to can be used as thermoplastics, For example, a homopolymer of methyl methacrylate or randomness of acrylate, or randomness of butyl acrylate and other monomers, Acrylic resin represented by poly butyl polycarbonate resin which contains bisphenol A, a 3,3,5-trimethyl cyclohexylidene bisphenol, etc. as a which the ring opening methathesis of the norbornene derivative was carried out, or its hydrogenation acrylate system resin, such as a block or a graft polymer, etc., Polycarbonate system resin, such as APEL by Mitsui Chemicals, Inc., ZEONOR by Nippon Zeon Co., Ltd., ZEONEX, ARTON by JSR, etc.). polymer (for example, OPUTORETTSU by Hitachi Chemical Co., Ltd., etc.), A homopolymer of butyl

[0186]As thermoplastics, it may have a carbon-carbon double bond or/, and a SiH group which have a SiH group and reactivity in a molecule. In a point that a hardened material obtained becomes tougher easily, it is preferred to average a carbon-carbon double bond or/, and a SiH group which have a SiH group and reactivity in a molecule, and to have in [one or more] one molecule. is not limited to this.

[0187]As thermoplastics, it may have other cross-linking groups. As a cross-linking group in this case, an

JP,ZUUS-ZDI1/U,A [UEIAILEU UESURIPIIUN]

socyanate group, hydroxyl, alkoxy silyl groups, etc. are mentioned. In a point that the heat resistance of a hardened material obtained becomes high easily, it is preferred to average a cross-linking group and to epoxy group, an amino group, a radical polymerization nature unsaturation group, a carboxyl group. an have in [one or more] one molecule.

in a point that compatibility with the (A) ingredient or the (B) ingredient becomes good easily, it is preferred that a number average molecular weight is 10000 or less, and it is more preferred that it is 5000 or less. On distribution is three or less, it is more preferred that it is two or less, and it is still more preferred that it is [0188] As a molecular weight of resin made from heat plasticity, although there is no limitation in particular, number average molecular weight is 10000 or more, and it is more preferred that it is 100000 or more. In a point that viscosity of a mixture becomes low and a moldability becomes good easily although there is no the contrary, in a point that a hardened material obtained becomes tough easily, it is preferred that a limitation in particular also about molecular weight distribution, it is preferred that molecular weight

[0189]thermoplastics — loadings — **** — especially — limitation — there is nothing — although — it becomes weak easily, and if large, heat resistance (elastic modulus in an elevated temperature) will become is desirable — the amount used — a minimum — hardenability — a constituent — the whole — five — %of the weight — more — desirable — ten — % of the weight — it is — it is desirable — the amount used -- a maximum -- hardenability -- a constituent -- inside -- 50 -- % of the weight -- more -- desirable 30 -- % of the weight -- it is . A hardened material which will be obtained if there are few additions 1.5 or less.

may grind, may mix by a particle state, it melts and mixes to a solvent, and thermoplastics is good also as a dispersion state. In a point that a hardened material obtained becomes transparence easilier, it is preferred [0191]It may melt in the (A) ingredient or/, and the (B) ingredient, and may mix as a uniform state, and it thermoplastics may be directly dissolved in the (A) ingredient or/, and the (B) ingredient, and it may mix to melt in the (A) ingredient or/, and the (B) ingredient, and to mix as a uniform state. Also in this case, uniformly using a solvent etc., and is good also as a uniform dispersion state or/, and the mixed state [0190]A single thing may be used as thermoplastics and it may use combining two or more things. except for a solvent after that

constituent becomes it is low and good [a moldability] easily, it is preferred that a coefficient of variation distribution or may have two or more peak particle sizes, from a viewpoint that viscosity of a hardenability diameter is 10 micrometers. Although there may be distribution of a particle system, and it may be single [0192]When making it distribute and using thermoplastics, various mean particle diameter can be set up, but a minimum of desirable mean particle diameter is 10 nm, and a maximum of desirable mean particle of particle diameter is 10% or less.

(Antiaging agent) An antiaging agent may be added to encapsulant of this invention. As an antiaging agent, carboxylate and the sulfides containing hindered phenol system sulfides. Polysulfide, dithiocarboxylic acid salts, thiourea, thio phosphate, a sulfonium compound, thioaldehydes, thioketones, mercaptal, mercaptol, agent, etc. are mentioned. As a sulfur-systems antiaging agent, mercaptans, salts of mercaptan, Sulfide an antiaging agent generally used, for example, citrate and phosphoric acid, a sulfur-systems antiaging monothio acid, polythio acid, thioamides, and sulfoxides are mentioned.

naphthylamine, the N,N'-second butyl- p-phenylene diamine, phenothiazin, and N,N'-diphenyl-p-phenylene ģ (Radical inhibitor) Radical inhibitor may be added to encapsulant of this invention. As radical inhibitor, example 2,6-di-t-butyl-3-methyl phenol (BHT), A 2,2'-methylene-screw (4-methyl-6-t-butylphenol), propionate) methane, Amine system radical inhibitor, such as phenyl-beta-naphthylamine, alpha-Phenol system radical inhibitor, such as tetrakis (methylene-3 (3,5-di-t-butyl-4-hydroxyphenyl) [0193]These antiaging agents may be used alone and may be used together two or more sorts. diamine, etc. are mentioned.

an ultraviolet ray absorbent, 2 (2'–hydroxy–3',5'–di-t–buthylphenyl) benzotriazol, bis(2,2,6,6-tetramethyl 4– (Ultraviolet ray absorbent) An ultraviolet ray absorbent may be added to encapsulant of this invention. As [0194]These radical inhibitor may be used alone and may be used together two or more sorts. piperidine)sebacate, etc. are mentioned, for example.

In addition to this additive agent) In addition to this in encapsulant of this invention, use or/, and a thing [0195]These ultraviolet ray absorbents may be used alone and may be used together two or more sorts. proposed are begun as a filler of the conventional sealing agents, such as an epoxy system, Colorant, a

release agent, fire retardant, a fire-resistant auxiliary agent, a surface-active agent, a defoaming agent, an interception agent, a nucleating additive, the Lynn system peroxide decomposition agent, lubricant, paints, a emulsifier, A leveling agent, a crawling inhibitor, an ion trap agent, a thixotropic grant agent, A tackifier, a stabilizing agent, an electro-conductivity applying agent, a spray for preventing static electricity, a radiation methyl ethyl ketone, and methyl isobutyl ketone. J. chloroform, methylene chloride, 1, and 2-dichloroethane. particular that can be used is not limited and is illustrated concretely, Hydrocarbon system solvents, such metal deactivator, a thermally conductive grant agent, a physical-properties regulator, etc. can be added. preservation stable improving agent, anti-ozonant, light stabilizer, a thickener, in a range which does not solvent [, such as ether system solvents, such as 1, 4-dioxane, 1,3-dioxolane, and diethylether, acetone, as benzene, toluene, hexane, and heptane, a tetrahydrofuran, Halogen system solvents, such as ketone spoil the purpose and an effect of this invention, a plasticizer, reactive diluent, an antioxidant, a heat (Solvent) Encapsulant of this invention can also be dissolved and used for a solvent. If a solvent in can be used conveniently.

used is hard to be acquired, and if there is much amount used, a solvent will remain into material and it will amount used are 10mL. An effect of using solvents, such as hypoviscosity-izing, if there is little amount amount used to the hardenability constituent 1g to be used are 0.1ml, and maximums of the desirable be easy to become problems, such as a heat crack, and it becomes in cost and disadvantageous, and industrial-utilizations value falls. [0197] Although the amount of solvents to be used can be set up suitably, minimums of the desirable [0196]As a solvent, toluene, a tetrahydrofuran, 1,3-dioxolane, and chloroform are preferred.

s in 100 ** for the same reason, it is more preferred that it is 1.0 or less Pa-s, and it is still more preferred 1.0 Pa-s or less, and it is preferred that it is especially 0.1 or less. It is preferred that it is below 10 Pa and (Encapsulant description) As encapsulant of this invention, as described above, can use a thing of various preferred in 23 ** that they are 1000 or less Pa-s, it is more preferred that they are 10 or less Pa-s, and they are less than 5.0 Pa-s — further — this — better — it is preferred that they are especially ** and [0198]These solvents may be used alone and can also be used as two or more kinds of mixed solvents. combination, but. In a point that restoration nature to a slit is good, as viscosity of encapsulant, it is that it is 0.1 or less Pa-s.

[0199]Various things can be used also about the temperature dependence (thixotropy) of viscosity. [0200]Viscosity can be measured with E type viscosity meter.

may be separated 15 mm, it may arrange in parallel and it may straddle on a glass plate in the meantime as shown in drawing 1, a glass plate, an aluminum foil spacer, and a cover glass were fixed with adhesive tape. 60 or less seconds/cm. It is preferred that penetration time to the 25-micrometer crevice at 60 ** is 180 [0202]Penetration time to a crevice is measured by a following method. After loading a cover glass of 18– mm width so that an aluminum foil spacer (25 micrometers in thickness or 50 micrometers) of two sheets time to the 50-micrometer crevice at 60 ** is 120 or less seconds/cm, and it is more preferred that it is Thus, space (15mmx18mmx25micrometer or 50 micrometers) is prepared with a glass plate, aluminum foil, seconds/cm, and it is more preferred that it is 180 or less seconds/cm. It is preferred that penetration seconds/cm. It is preferred that penetration time to the 25-micrometer crevice at 23 ** is 600 or less crevice at 100 ** is 120 or less seconds/cm, and it is more preferred that it is 60 or less seconds/cm. preferred that it is 30 or less seconds/cm. It is preferred that penetration time to the 25-micrometer and a cover glass. As shown in drawing 1, after settling this thing on a hot plate, adjusting to preset or less seconds/cm, and it is more preferred that it is 120 or less seconds/cm. It is preferred that penetration time to the 50-micrometer crevice at 100 ** is 60 or less seconds/cm, and it is more permeated a 1-cm position from one of them reaches is measured, and it is considered as crevice temperature, and hanging down encapsulant to one side of a crevice, time until encapsulant which [0201]It is preferred that penetration time to the 50-micrometer crevice at 23 ** is 600 or less seconds/cm as an infiltration speed to a crevice, and it is more preferred that it is 120 or less

at 120 ** is less than 120 seconds, and it is more preferred that it is less than 60 seconds. It is preferred that gel time at 150 ** is less than 60 seconds, and it is more preferred that it is less than 30 seconds. It is preferred that gel time at 100 ** is less than 180 seconds, and it is more preferred that it is less than 120 seconds. When hardenability is late, workability as encapsulant worsens. Conversely, when quick, .0203]Aithough it can set up arbitrarily about the hardenability of encapsulant, it is preferred that gel time

[0204]Gel time in this case is investigated as follows. 50-micrometer-thick aluminum foil is placed on a hot plate adjusted to preset temperature, time until it hangs down and gels 100 mg of encapsulant on it is measured, and it is considered as gel time.

(Hardening) It can mix beforehand, and encapsulant of this invention can be stiffened a part of SiH group in a hardenability constituent, carbon-carbon double bond which has reactivity, SiH group, or by making **** all react, and can be used as a material for a semiconductor device.

functional group in a constituent react by control of a reaction condition, or use of a reactant difference of once and an initial complement of each ingredient may be made to react, After mixing and making a part of a substituent (formation of B stage), a method of processing shaping etc. and stiffening further can also be residue to which mixed and a part was made to react, and making it react further, although it may mix at [0205]When making encapsulant react and making it harden, (A), (B), (C), (D) A method of mixing a back taken. According to these methods, viscosity control at the time of shaping becomes easy.

made to heat and react. A reaction is quick and a method of making it heat and react from a viewpoint that (0206)It can also be made to be able to react only by mixing as a method of stiffening, and can also be a heat-resistant high material is generally easy to be obtained is preferred.

more preferably. If reaction temperature is low, reaction time for making it fully react will become long, and temperature are 100 ** more preferably, and 300 ** of maximums of a desirable temperature are 200 ** .0207]Although many things can be set up as curing temperature, 30 ** of minimums of a desirable if reaction temperature is high, a fabricating operation will become difficult easily.

[0208]Although hardening may be performed at a fixed temperature, a multi stage story or per-continuum temperature may be changed if needed. rather than carrying out at a fixed temperature — a multi stage story — in a point that a uniform hardened material made it more distorted [to react] raising

'0209]Atthough various cure time can also be set up, it is more desirable in a point that a uniform hardened material made it more distorted [to react by a low-temperature long time comparatively] and which is not temperature-like or continuously and which is not is easy to be obtained, it is desirable. is easy to be obtained than making it react in an elevated-temperature short time.

[0210]A pressure of reaction time can also be set up variously if needed, and it can also be made to react by ordinary pressure, high voltage, or a reduced pressure state. In a point which is easy to remove volatile matter content generated by a case that restoration nature to details is good, it is preferred to make it harden by a reduced pressure state.

[0211]In a viewpoint of being hard to produce generating of a void to inside of encapsulant, and a problem preferred that weight loss under hardening is 5 or less % of the weight, it is more preferred that it is 3 or of a process by outgas from encapsulant in a manufacturing process for which encapsulant is used, It is less % of the weight, and it is still more preferred that it is 1% or less.

nitial mass of weight which decreased can carry out it comparatively, and it can ask for it with 10 ** the [0212]Weight loss under hardening is investigated as follows. Using a thermo gravity analysis apparatus, from a room temperature to 150 **, temperature up of 10 mg of the encapsulant can be carried out, an heating rate for /

and a thing used as not less than 150 ** is more preferred. In this case, Tg is investigated as follows. Peak obtained by stiffening encapsulant from a viewpoint of being good will be not less than 100 ** is preferred, condition of for mode, 10 Hz of test-frequencies, 0.1% of distortion, ** / power ratio 1.5, and degree/of 5 temperature of tandelta of dynamic viscoelasticity measurement (IT measurement control company make DVA-200 use) which was pulled using a prismatic specimen of 3mmx5mmx30mm, and was measured on (Hardened material description) That from which Tg of a hardened material in which heat resistance is 0213]In a point of being hard to cause a problem of silicone contamination to an electronic industry material, it is preferred that content of Si atom in a volatile constituent in this case is 1% or less.

[0214]In a point that reliability becomes being hard to produce in wiring etc. which were closed when used as encapsulant highly in problems, such as ion migration, It is preferred that extraction ion content from a hardened material is less than 10 ppm, it is more preferred that it is less than 5 ppm, and it is still more ** of temperature-up side is set to Tg.

. [02.15]In this case, extraction ion content is investigated as follows. With 50 ml of ultrapure water, the cut but hardened material 1g is put into a container made from Teflon (R), and is sealed, and it processes on preferred that it is less than 1 ppm.

21 **, 2 atmospheres, and conditions of 20 hours. An obtained extract is converted into concentration in 、 a hardened material using a value of content of Na and K which were obtained by analyzing by an ICP mass ONEKUSU]-500 use, column:AS12-SC), and it asks for it. Content in a hardened material of Na, K, Cl, and analysis (Yokogawa Analytical Systems, Inc. make HP-4500 use), and it asks for it. On the other hand, the (Candidate for closure) A semiconductor, electronic parts, an electronic circuit, or electric contact can be same extract is converted into concentration in a hardened material using a value of content of Cl and Br Br which were obtained as mentioned above is totaled, and it is considered as extraction ion content. which were obtained by analyzing by the ion chromatography method (product DXI made by die closed using encapsulant of this invention.

[0216]It sees, although usual silicon was used as a base as a semiconductor, and there is nothing then and what used various metal, such as gallium, indium, germanium, and zinc, as a base is included. In addition, an LSI, etc. are contained. A thing of a thing (ball semiconductor) of filminess and ball state besides a thing of about connection parts, such as protective films, such as a passivation film provided on a semiconductor, a such as a various sensor, a solar cell, etc. are included. Various ICs, such as a memory and a logic circuit, organic semiconductor is also included. Light emitting devices which are a transistor, resistance, a diode, etc. as an element, such as others and a light emitting diode and a semiconductor laser, photo detectors, plate-like [as shape of a semiconductor / usual] and block like shape, etc. are contained. A large-sized squares may be variously used also about a semiconductor size. In addition, it can set up suitably also thing like 25 mm squares from an applicable for example, small thing like 0.3 mm squares or 100 mm solder bump, a gold bump, an aluminum pad.

substrate, a lithium ion battery, a fuel cell, etc. are mentioned, for example. An organic electroluminescence [0217]Others and automobile circumference electronic parts, liquid crystal circumference electronic parts, board etc. are mentioned as organic electroluminescence (electroluminescence) circumference electronic parts. As optical recording circumference electronic parts, disc substrates VD (video disk), CD/CD-ROM, parts for various electronic control, such as an ignition coil and fuel supply, a gauge part article, a lighting part, etc., are mentioned, for example. As liquid crystal circumference electronic parts, others and a liquid capacitor, etc. as electronic parts are included. As automobile circumference electronic parts, electronic crystal display which are light polarizer, a light filter, a transistor of TFT, a transparent conducting film, a CD-R/RW, DVD-R/DVD-RAM, MO/MD, PD (phase change disk), for optical cards, etc., a light-emitting electronic parts, optical recording circumference electronic parts, etc. which are a rye backed lance, a cell circumference electronic parts, organic electroluminescence (electroluminescence) circumference liquid crystal, etc. are also contained, for example. As cell circumference electronic parts, a solar cell component, a pickup lens, a light sensing portion article, etc. are mentioned.

[0218]As an electric circuit, other photoelectron circuits of a rigid printed circuit board, a flexible printed circuit board, and a build up board, etc. are mentioned.

proposed as a sealing method of the conventional sealing agents, such as an epoxy system. For example, it can also close by casting, potting, dipping, a press, coating, or screen-stencil, and molding closure can also [0219]As electric contact, a node of a substrate and a cable, a node of a cable and a cable or a node of substrates, a node of a substrate and an element, a node of a cable and an element, etc. are mentioned. be carried out like a transfer mold. After carrying out dispensing, it can close also by a method (under (Sealing method) A method of closing can also take various methods including use or/, and a thing filling) of making it permeate a crevice.

[0220]Various processing can also be performed if needed at the time of closure. For example, processing etc. for control of a void generated at the time of closure are also applicable, and it can also defoam, after etc. which defoam encapsulant or encapsulant made to react in part with centrifugality, decompression,

pressure, decompression, and application of pressure can be applied. It is [being / where crevices, such as under-filling, are made to permeate / a case, and] sometimes effective to carry out by decompression to [0221] Various pressure conditions at the time of closing can also be set up, and any method of ordinary improve perviousness to a detailed part. Regularity may be sufficient as a pressure and it may change continuation or a stage target to a target with the passage of time if needed.

filing, are made to permeate, and a case where he would like to improve perviousness to a detailed part — warming — it is sometimes effective to carry out in the state. In this case, for example, temperature of 50 :0222]Various temperature in a case of closing can also be set up. a case where crevices, such as under

r* – 200 ** is applicable. Regularity may be sufficient as temperature and it may change continuation or a stage target to a target with the passage of time if needed.

(Example of encapsulant) Although a concrete example of encapsulant is given to below, encapsulant of his invention is not limited to this.

.0223]As encapsulant of a semiconductor, a capacitor, a transistor, a diode, A light emitting diode, IC, LSI a sensor, etc. Casting, potting, Encapsulant for closing by dipping, a transfer mold, coating, screen-stencil compression flow type), Encapsulant at the time of IC package mounting of BGA, CSP, etc. (under-filling etc. is mentioned, More specifically COB(s), such as a light emitting diode, IC, LSI, and a sensor, Potting passivation film, a junction coat film, and a buffer coat film, are also the examples of encapsulant of a mentioned. In addition, various protective films used for a semiconductor previous process, such as a or reinforcement), encapsulant for stacked IC, encapsulant for the wafer levels CSP, etc. can be encapsulants, such as COF and TAB, under-filling of a flip chip (a capillary tube flow type and a

crystal with which a cell was filled up, a protective coating agent of a solar cell, encapsulant of a lithium ion ight source for optical recording, and a coating agent of a photo detector and encapsulant -- a protective .0224]As encapsulant of electronic parts, a deflection plate, a light filter, a transistor of TFT, A protective battery or a fuel cell, a protective coating agent of organic electroluminescence (electroluminescence), a coating agent of the electronic-parts circumference of a car and encapsulant are also mentioned further. 0226]As encapsulant of electric contact, contact protection (coating) agents, such as a substrate, an coating agent of a transparent conducting film and a liquid crystal display, and encapsulant of a liquid (0225] As encapsulant of an electronic circuit, a solder resist of rigid printed circuit board and flexible element and a substrate, a substrate and a substrate, and a cable, a junction coating agent, etc. are printed circuit board material and a build up board, a protective coating agent, etc. are mentioned.

nethod which was described above using encapsulant of this invention. In this case, what is necessary is Semiconductor device) A semiconductor device can be manufactured by closing a semiconductor by a to use it for a use which described encapsulant of this invention above, and just to manufacture a semiconductor device by a usual method.

QFP, SOP, TSOP, PGA, CSP, BGA, FCBGA using PI resin, ceramics, BT resin, or FR4 grade several-kinds substrate, Calling [QFN, COB, COF, TAB, the wafer level CSP, a stacked package, BCC, MCM, SIP, etc.] various IC packages, a light emitting diode part article, an optical sensor section article and a substrate in 0227]A semiconductor device is a device containing various semiconductors, for example, generally DIP, which they were carried, a module, etc. are mentioned.

(Synthetic example 1) Agitating equipment, the tap funnel, and the condenser tube were set to the two-lot Example] This invention is not limited by the following although the example and comparative example of this invention are shown below.

following which are the (B) ingredient of this invention are contained as the main ingredients. The platinum 3wt% as platinum content) of 200 g of triallyl isocyanurate, 200g of toluene, and a platinum vinyl siloxane H-NMR, it turned out that the SiH group of 8.08 mmol/g is contained. Although output is a mixture, the dibromomethane was used for the internal standard and the content of the SiH group was calculated by Rask of 5L. The toluene 1800g, 1, 3, and 5 and 1440 g of 7-tetramethyl cyclotetrasiloxane were put into nours, decompression distilling off of unreacted 1,3,5,7-tetramethyl cyclotetrasiloxane and toluene was this flask, and it heated and stirred in a 120 ** oil bath. The mixed liquor of 1.44 ml of xylene solutions complex was dropped over 50 minutes. After warming and stirring the obtained solution as it was for 6 syclotetrasiloxane reacts to triallyl isocyanurate by 1 H-NMR (the reactant A is called). When 1.2– carried out. It turned out that, as for this thing, a part of SiH group of 1, 3, 5, and 7-tetramethyl inyl siloxane complex which is the (C) ingredient of this invention is contained.

Formula 41]

http://www4.ipdl.inpit.go.ip/cgi-bin/tran web cgi eiie?atw u=httb%3A%2F%2Fwww4.ipdl.inpit.go... 2008/03/06

solution (3wt% as platinum content) 31.5microL of the allyl glycidyl ether 95.0g and a platinum vinyl siloxane cyclotetrasiloxane, and the toluene was carried out. It turned out that a part of SiH group of 1, 3, 5, and 7– tetramethyl cyclotetrasiloxane carries out the hydrosilylation reaction of this thing with allyl glycidyl ether (Synthetic example 2) The magnetic stirring child, the tap funnel, and the condenser tube were set to the the content of the SiH group was calculated by ¹H-NMR, it turned out that the SiH group of 6.63 mmol/g four-lot flask of 1L. The toluene 200g, 1, 3, and 5 and 200 g of 7-tetramethyl cyclotetrasiloxane were put by ¹H-NMR (the reactant B is called). When 1,2-dibromomethane was used for the internal standard and is contained. Although output is a mixture, the following which are the (B) ingredient of this invention are into this flask, and it heated and stirred at 50 ** in the bottom oil bath of a nitrogen atmosphere. Xylene contained as the main ingredients. The platinum vinyl siloxane complex which is the (C) ingredient of this complex and the mixture of 50 g of toluene were dropped over 30 minutes from the tap funnel. After heating by the ** for 1 hour, decompression distilling off of unreacted 1, 3 and 5, 7-tetramethyl

examples 1 and 2 as a (B) ingredient by the combination shown in the table using spherical silica as a (D) ingredient, using a platinum vinyl siloxane complex as a (C) ingredient, using triallyl isocyanurate as a (A) (Examples 1 and 2) Encapsulant was created using the reactants A and B compounded in the synthetic

[0231]Viscosity, crevice penetration time, the weight loss under hardening, and gel time were measured using such encapsulants.

neated gradually in 150 **/the way of 1 hour, and the hardened material was obtained [for 60 **/6 hours] for 120 **/1 hour for 80 **/1 hour for 70 **/1 hour. Tg and extraction ion content were measured using '0232]Such encapsulants were put into the ointment can so that it might become a depth of 3 mm, it

[Table 1]

		安加例1	米瓶例2
₽.	トリアリバインシアヌレート	12.1	10.0g
	反応物A	18. Og	
	反応制用		18. 2K
	自全制媒溶液	90mg	85mg
	充填材	32. 1≰	28. 7K
	硬化差球剂	90mg	85mg
	被着付与割1	1, 61g	
	接着付与前2	0. 30g	O. 28g
野山原平	(Pe-e)	2, 84	0.64
		929	8
	3,09	. 09	41
	1001	16	10.04
	(紙化中の重量減少(%)	0.0	
	ゲル化時間 120℃	38	_11
	150°C	7	3
更黄铜刀	T _K (°C)	118	88
	抽出イオン合有量(ppm)	<2. 4	

白会勉等部:白会だニルシロキサン個体のキシンが設(日会として3448合業) 党権制:球状シノか(日本化学社製、シルスターLEDSS(平均数数4.8μm, 60μm以上の数子の合有率0.0%))

他た説は死!! - エテースシロヘキャノード 指着な与表!! グリンドキンプログル・リメーキングリン 数着は与表!! アンミーウムトリスエテルアセトート

the crevice between 50-micrometer thickness 1.8 cm in length was created by 15-mm width like drawing 2. After settling this thing on the hot plate, adjusting to preset temperature, and hanging down encapsulant to one side of a crevice, time until the encapsulant which permeated a 1-cm position from one side reaches [0234]Crevice penetration time: The aluminum foil spacer was put with the glass plate of two sheets, and Viscosity: The viscosity in 23 ** was measured with E type viscosity meter.

to 150 **, temperature up of about 10 mg of the encapsulant was carried out, the initial mass of the weight asked with the peak temperature of tandelta of the dynamic viscoelasticity measurement (IT measurement 0235]Weight loss under hardening. Using the thermo gravity analysis apparatus, from a room temperature .0237]Pull using the prismatic specimen of Tg3mmx5mmx30mm of a hardened material, and The mode, It control company make DVA-200 use) measured on condition of for 10 Hz of test-frequencies, 0.1% of temperature, and time until it hangs down and gels about 100 mg of encapsulant on it was measured. which decreased carried out it comparatively, and it asked for it with 10 ** the heating rate for /. .0236]Gel time: 50-micrometer-thick aluminum foil was placed on the hot plate adjusted to preset distortion, ** / power ratio 1.5, and degree/of 5 ** of temperature-up side.

analysis (Yokogawa Analytical Systems, Inc. make HP-4500 use), and it asked for it. On the other hand, the and the conditions of 20 hours. The obtained extract was converted into the concentration in the hardened same extract was converted into the concentration in the hardened material using the value of the content Na, K, Cl, and Br which were obtained as mentioned above was totaled, and it was considered as extraction [0238]Extraction ion content: With 50 ml of ultrapure water, about 1 g of cut-out hardened materials were out into the container made from Teflon (R), and were sealed, and it processed on 121 **, 2 atmospheres, of CI and Br which were obtained by analyzing by the ion chromatography method (product DX[made by die ONEKUSU]-500 use, column:AS12-SC), and it asked for it. The content in the hardened material of material using the value of the content of Na and K which were obtained by analyzing by an IGP mass ion content.

penetration time measurement was filled up was heated for 10 minutes in 150 ** hot wind oven, it became 0239]When that with which the 50-micrometer crevice which used such encapsulants for crevice a hard hardened material.

and low-temperature fast curability and was excellent as encapsulant. Therefore, a reliable semiconductor Effect of the Invention] The encapsulant of this invention has the characteristic which are hypoviscosity device can be manufactured using this.

* NOTICES *

JPO and INPIT are not responsible for any damages caused by the use of this translation.

I. This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a perspective view of the jig used for measurement of the penetration time to the crevice concerning this invention.

[Drawing 2]It is a perspective view of the jig used for measurement of the penetration time to the crevice concerning this invention.

* NOTICES *

JPO and INPIT are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]

[Drawing 2]

